MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for March, 1904, is based on data from about 3300 stations, classified as follows:

Weather Bureau stations, regular, telegraph, and mail, 167; West Indian Service, cable and mail, 4; River and Flood Service, regular 43, special river and rainfall, 190, special rainfall only, 56; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 3025; Canadian Meteorological Service, by telegraph and mail, 20, by mail only, 13; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 75; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25; The New Panama Canal Company, 5; Central Meteorological Observatory of Mexico, 20 station summaries, also printed daily bulletins and charts, based on simultaneous observations at about 40 stations; Mexican Federal Telegraph Service, printed daily charts, based on about 30 stations.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. R. C. Lydecker, Territorial Meteorologist, Honolulu, Hawaii; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander H. M. Hodges, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; Rev. José Algué, S. J., Director, Philippine Weather Service; and H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard meridian is that of San José, $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Stormy weather prevailed over the eastern part of the Atlantic Ocean during the first decade of the month. From the 1st to the 6th the barometer continued low over the Bay of Biscay, Spain, and Portugal, and during the 7th and 8th a disturbance evidently moved from that region toward the Irish coast, where the barometer fell to 29.48 inches at Valentia. By the 9th this disturbance had apparently united with a barometic depression of great energy that appeared in the vicinity of the Azores, where, at Horta, the barometer fell rapidly to a minimum of 29.10 inches, with a maximum wind velocity of 60 miles an hour from the south. During the 13th and 14th a disturbance that was probably identical with a storm that passed eastward over Newfoundland during the 11th, crossed the north part of Scotland, and a disturbance that moved eastward over the Canadian Maritime Provinces on the 16th apparently passed north of the British Isles during the 19th. On the 22d a disturbance passed southeastward over the British Isles. From the 23d to 25th the barometer continued high over the British Isles, and fell from the 26th to 30th to a reported minimum of 29.00 at Stornoway, Scotland, with gales on the British coasts during the 29th and 30th.

In the United States there was a succession of disturbances that moved from the north Pacific coast southeastward over the Rocky Mountain districts to the Mississippi Valley, and thence northeastward over the Canadian Maritime Provinces.

The severest storm of the month appeared on the north Pacific coast during the night of the 9th, and on the morning of the 10th barometric pressure was below 29.00 inches on the Washington and Oregon coasts. The gales that attended this storm were severe from British Columbia to San Diego, Cal., and heavy rain fell in the coast districts and heavy snow in the mountain regions of the North Pacific States. After leaving the coast this storm rapidly lost intensity.

The Humboldt Standard, Eureka, Cal., of March 10, 1904, remarks as follows regarding the work of the Weather Bureau in connection with this storm:

> One of the most violent storms that ever occurred on the coast of northern California was heralded yesterday morning by the display of southeast storm warnings at the local Weather Bureau station. The warnings were ordered up by district forecaster McAdie twelve hours before the storm struck this city. All of the shipping in the bay having ample notice from the Weather Bureau there was no damage to vessels, all shipping being securely tied up, with no vessels at anchor.

Another severe storm appeared on the north Pacific coast on the 19th.

Chart II shows the remarkably uniform progression across the United States of the barometric depressions of the month, and the following are notable features reported in connection with the more important disturbances that traversed the country:

A disturbance that appeared on the north Pacific coast on the 1st moved rapidly south of east over the Plateau and

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocity.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	*29, p. m.	54	114	5, p. m.	45	64	3,225	5.0	645	26.9
II	4, a. m.	41	125	6, p. m.	39	95	1,775	2.5	710	29.6
III	7, p. m.	53	108	11, a. m.	46	73	1,700	3.5	486	20.2
IV	{13, a. m.	53	105{	17, p. m.	39	75	2,075	4.5	462	19.2
	{14, a. m.	27	97{							
V	17, a. m.	40	100	19, a. m.	43	75	1,450	2.0	725	30.2
VI	19, a. m.	53	108	21, p. m.	47	65	2,100	2.5	840	35.0
VII	21, p. m.	48	110	24, p. m.	42	70	2,100	3.0	700	29.2
VIII	24, p. m.	54	114	29, p. m.	38	75	2,800	5.0	560	23.3
Sums							17,225	28.0	5,128	213.6
Mean of 8 paths							2,153		641	26.7
Mean of 28 days									615	25.6
Low areas.										
I	1, a. m.	48	125	3, p. m.	48	68	2,930	2.5	1,180	49.2
II	3, a. m.	33	115	8, p. m.	47	65	3,525	5.5	641	26.7
III	8, a. m.	51	120	12, a. m.	47	65	3,400	4.0	850	35.4
IV	10, p. m.	48	125	16, a. m.	47	65	4,050	5.5	737	30.7
V	14, a. m.	45	125	19, a. m.	44	66	4,050	5.0	810	33.8
VI	17, a. m.	48	125	20, p. m.	46	60	3,400	3.5	971	40.5
VII	19, p. m.	48	125	23, a. m.	47	65	3,375	3.5	964	40.2
VIII	22, a. m.	48	125	26, p. m.	47	60	3,750	4.5	833	34.7
IX	28, a. m.	42	108	†2, p. m.	47	60	2,950	5.5	536	22.3
Sums							31,450	39.5	7,522	313.5
Mean of 9 paths							3,494		836	34.8
Mean of 39.5 days									796	33.2

*February. †April.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*C. C. Cooper.*

Rocky Mountain districts by the morning of the 2d, attended by high winds and followed by a cold wave over the middle and northern Rocky Mountain and Plateau districts. The storms that appeared on the north Pacific coast on the 10–11th and 19th were sufficiently severe to prostrate forest trees. After the 20th the Pacific coast was comparatively free from high winds.

In connection with a storm from the Pacific that crossed the middle Mississippi Valley during the 17th, exceptionally heavy rain occurred in the lower Mississippi Valley, a depth of 2.58 inches being noted at New Orleans where streets were flooded. On the 21st, when a storm from the Pacific crossed the lower Missouri Valley, severe local storms occurred in Missouri. During the evening and night of the 24th a disturbance from the Pacific moved from the lower Missouri Valley to Lake Superior, attended by severe local storms in Missouri, Illinois, Indiana, Wisconsin, and Michigan, that destroyed a number of buildings and caused some loss of life. It appears from a report of the Weather Bureau observer at Grand Rapids, Mich., that a well-defined tornado crossed the southeastern part of that city in the evening, traveling in a northeast direction. At the Weather Bureau office the wind attained a velocity of 52 miles an hour, for a five-minute period, with an extreme velocity of 60 miles an hour, at 10:05 p. m., and the tornado was attended by the usual electrical display, and by large hailstones. The storm track varied in width from 25 to 200 feet and was about 2 miles in length. The tornado cloud touched the ground at intervals, and there were many chimneys blown down, windows blown out, barns and outhouses demolished, and residences destroyed or twisted off their foundations. The property loss at Grand Rapids aggregating about $15,000, and four persons were injured.

The principle cold waves of the month swept from the British Northwest Territories over the southern and eastern districts from the 1st to the 4th, and from the northwest and middle-western districts eastward and southward from the 23d to the 26th. In the Rocky Mountain districts the cold waves were more frequent and general than during the winter months. An estimate of the value of the Weather Bureau frost warnings finds expression in the following article that appeared in the San Francisco Chronicle of March 20, 1904:

The farmer shares equally with the merchant the advantages of Weather Bureau warnings, and every year this service increases in efficiency and value. Many millions of dollars have already been saved by the fruit growers of California by timely warnings sent out, enabling citrus growers to protect their crops against frost, and the raisin, prune, and apricot growers to stack their trays of drying fruit before overtaken by rain.

The Daily States, New Orleans, La., March 4, 1904, remarked as follows:

The warnings of the United States Weather Bureau were as usual timely and accurate, and they enabled the protection of the berry crops and truck gardens and have thus saved thousands of dollars to the farming interests.

The Advertiser, Montgomery, Ala., March 5, 1904, referred to the warnings as follows:

The Weather Bureau's warning saved many thousand young cabbages and tomatoes which were exposed in cold frames, almost ready to transplant, and which would have been killed had warnings not been received. This item of benefit from the Bureau's warnings means upward of of $50,000 or more to the truckers of this section. Had these young plants been killed, an entire new crop of early sets would have had to be started, which would make the vegetables too late to demand lucrative prices in the northern markets. The warning, verified to the degree, was far enough in advance to be of great benefit.

During the early part of the month mild weather and heavy rain, in connection with heavy ice gorges, threatened property along rivers of the Eastern States, notably in eastern Pennsylvania, New Jersey, and parts of New York and New England. As the month advanced the gorges broke and passed down with almost a minimum amount of the damage anticipated. Serious floods occurred in the Sacramento River during the first decade of the month, and during the third decade heavy rain caused freshets in Illinois, Indiana, Michigan, Wisconsin, and, to some extent, in adjoining States. All of the floods of the month were carefully watched and advices and warnings concerning them were promptly issued for the benefit of all concerned. Full descriptions of the floods will be found under the heading "Rivers and floods."

NEW ENGLAND FORECAST DISTRICT.

The storms of the month were not so severe as those that usually occur in March. The greatest inconvenience to shipping resulted from the high winds of the 1st. The local papers commented upon this storm as follows:

From the Boston Herald:

Thanks to the forecaster, the mariners down on the water front got their warnings as early as 3 p. m. yesterday afternoon, and no craft stirred abroad. In consequence no disasters were reported this morning.

From the Boston Globe:

The storm was anticipated by the Weather Bureau officials, who caused warnings to be hoisted along the coast as early as 2 p. m. yesterday. So far as known at this office no disasters resulted to shipping in this vicinity.

J. W. Smith, District Forecaster.

WEST GULF FORECAST DISTRICT.

Frost or freezing temperature occurred in some parts of the district on several dates, and timely warnings were issued in connection therewith. No general storms occurred on the west Gulf coast.—*I. M. Cline, District Forecaster.*

NORTH CENTRAL FORECAST DISTRICT.

Two marked cold waves occurred. The first was present in the British Northwest Territories at the opening of the month. It moved southward and eastward, and by the evening of the 3d it had reached the eastern limits. Warnings were issued on the 1st and 2d well in advance of the cold wave. The temperature continued low in the Northwest, and on the morning of the 23d it showed evidence of extending eastward and southward.

Warnings were therefore issued on the 23d and 24th well in advance, and by the morning of the 26th the cold had extended over the entire district.

Several warnings were sent to open ports on Lake Michigan when severe storms were threatened. However, winter navigation was retarded more by ice than by windstorms. No losses to shipping have been reported.—*H. J. Cox, Professor and District Forecaster.*

ROCKY MOUNTAIN FORECAST DISTRICT.

Early on the 2d warnings of a cold wave were given general distribution in Utah, Wyoming, and eastern Colorado, with the information that high westerly winds were indicated for Utah and westerly shifting to high northerly winds for Wyoming and eastern Colorado. This storm proved to be the most severe of the winter, on account of the high winds that accompanied it, together with an unusually great and rapid fall in temperature. Warnings were also given distribution in Wyoming and northeastern Colorado during the morning of the 9th. On the 23d warnings were issued for Utah, Wyoming, and eastern Colorado, and were renewed the following morning in southern Wyoming and eastern Colorado.—*F. H. Brandenburg, District Forecaster.*

SOUTH PACIFIC FORECAST DISTRICT.

The month was unusually stormy, and while the intensity of the rain in central California has been exceeded in other Marches, the frequency, or number of rainy days, broke all records. In northern California the rainfall was so heavy as to cause serious floods in the Sacramento River and its tributaries. Storm warnings were displayed with unusual frequency, and warnings of rapid rises in the rivers of northern California were issued.—*A. G. McAdie, Professor and District Forecaster.*

NORTH PACIFIC FORECAST DISTRICT.

In the North Pacific States the month was unusually cold and stormy, and heavy snow in the mountains of eastern Oregon resulted in disastrous avalanches. The windstorms of the 10–11th and 19th were very severe, the wind on the 10th reaching a velocity of 84 miles an hour at North Head, Wash. Timely warnings were issued for the gales of the month.—*E. A. Beals, District Forecaster.*

RIVERS AND FLOODS.

The ice situation in the principal rivers of the United States during the month may be summarized as follows:

In northern New England the ice remained firm throughout the month and in southern New England until about the 20th. At the opening of the month the Mississippi River was frozen from Davenport northward, and the Missouri River north of Sioux City. At the close of the month the Missouri River was frozen from Bismarck northward, and the Mississippi north of La Crosse, with floating ice observed at considerable distances below these places. There was no ice of consequence in the Ohio and Potomac rivers.

The ice gorges that formed in the Susquehanna River in January continued until the latter part of the month, causing numerous floods and the loss of a large amount of property. The following report on these gorges was prepared by Mr. E. R. Demain, official in charge, United States Weather Bureau office, Harrisburg, Pa.:

The ice which broke up on the Juniata during the latter part of February gorged near Duncannon. On the morning of March 2 the ice at the mouth of the Juniata moved, increasing the size of the gorge at Duncannon and causing the flooding of some houses and industrial plants. The ice on the West branch broke at Lockhaven about 2 p. m., March 3, and moved out on a 12-foot flood. Warnings were immediately wired to Williamsport and Selinsgrove on the receipt of the information, and the postmaster at Duncannon was informed that the flood from the West branch would probably increase the danger from backwater at that point. The Paxton furnaces and other industrial plants in south Harrisburg and Steelton were advised to prepare for a big flood, and this was done in many instances. When the flood from the West branch reached Duncannon on the morning of March 4 it swept away the gorge at that place without destroying the Clarks Ferry bridge, which was thought by many to be in great danger, and the whole mass of ice and water moved down, breaking up the ice on the river as it advanced. The ice broke at Fort Hunter, 7 miles above Harrisburg, at 10:05 a. m., March 4, and at 10:55 a. m. the ice began to move at Harrisburg, the water rising steadily from 13.5 feet at 8 a. m. to 16 feet at noon. Between noon and 1 p. m. the river at Harrisburg rose 4 feet, to a stage of 20 feet. After 1 p. m. the rise was more gradual until 3:15 p. m., when 23.3 feet was registered on the gage at the pumping station. The water receded slowly from that time till 11 p. m., when the stage was 21.3 feet. The ice at Harrisburg broke on both sides of the island at the same time. This great mass of ice, moving down and increasing the congestion below, formed a gorge near Middletown and another a short distance below Highspire. The ice on the west side of the island at Harrisburg soon stopped, but the ice in the east channel continued to move till about 2:30 p. m., when the channel became choked. About 4:30 p. m. the ice in the west channel began to move, and this channel continued open the rest of the day. All the lowlands from south Harrisburg to Middleton, a distance of about 9 miles, were submerged, the water at Middleton being 1.5 feet higher than in the great flood of June 2, 1889, and at Highspire about 0.8 of a foot higher, but by midnight the water at both of these towns had receded about 2 feet.

No material changes occurred in the situation in the main river or in the gorged districts of the North branch from the evening of March 4 till the morning of the 8th, the water in the pools above the gorges fluctuating during this time as the gorges opened and again became choked with floating ice. The Juniata, West branch, and the headwaters of the North branch began to fall on the 4th, the fall continuing until the morning of the 7th, when rain and milder weather occurred over the whole watershed. This started a rise in all streams, and by the night of the 7th all the branches of the system were rising rapidly. On the evening of the 7th Catawissa reported that the ice had moved off Roaring, Catawissa, and Nescopeck creeks, taking away several wagon bridges. The ice moved at Harrisburg, above the upper bridge, at 6 a. m. on the 8th, but the movement continued only a few minutes. The river continued to rise steadily during the morning; at 7 a. m. it registered 21.2 feet and at 10 a. m. 22.3 feet on the Harrisburg gage. At Middletown and other points below Harrisburg, nearer the Middletown gorge, the rise was more rapid. At Middletown the water reached a stage of 34.5 feet about 10 a. m., the highest ever known and said to be 5 feet higher than the flood of June 2, 1889. The excitement at Middletown, Highspire, Steelton, and Harrisburg was great; the telephone in the office was in use constantly during the morning, requiring the attention of an observer to answer the calls for information. Hundreds of people desired to know how much more water was expected, a question which it was impossible to answer definitely; they were informed that the only hope of early relief was in the breaking of the gorges at Middletown and Highspire. Fortunately this occurred about 10 a. m. and at once relieved the seriousness of the situation at Middletown and a little later at Highspire, Steelton, and Harrisburg. The river began to fall at Harrisburg about 10:15 a. m., but the ice did not begin to move till about 11:40 a. m. All the bridges at Harrisburg stood the shock well, except the new Market Street Bridge; several large stones were knocked out of the twentieth pier of this structure, from the Harrisburg side, by heavy cakes of ice, damaging it to such an extent that it was found necessary to close the bridge to traffic. This bridge had been in use only about ten days. Immediately steps were taken to protect the damaged pier, and a wooden "nosing" was hastily constructed and placed over the damaged part before any further movement of heavy ice occurred. This doubtless saved the pier from destruction. The bridge was opened to traffic again early on the morning of March 12.

While the breaking of the Middletown gorge greatly lessened the danger on the main river, the conditions in the gorged district of the North branch were becoming more serious. At Wilkesbarre the river was 29 feet at noon, and the situation in the vicinity of Bloomsburg and Catawissa continued very serious. Early in the morning of the 8th the ice began to move at Wilkesbarre, the movement continuing for about two hours; the ice then gorged solidly and remained stationary the rest of the day. The ice also moved at Boyds, between Catawissa and Danville, early on the 8th. The gorge at Bainbridge, below Harrisburg, was reported to have started on the 8th, moving down on and dislodging the gorge at Turkey Hill, the accumulated ice and water rushing down and gorging below Safe Harbor, submerging the low parts of that town and destroying many houses and one or two county bridges. The ice broke at Pittston, above Wilkesbarre, about midnight of the 8th and moving down lodged on the gorge at Nanticoke, the water rising at 30.6 feet at Wilkesbarre about 1:30 a. m. of the 9th, flooding more houses and causing several coal companies to suspend operations. The ice moved about 400 feet at Catawissa at 11.30 a. m. of the 9th, carrying away the two east spans of the Catawissa Bridge which lodged near the east shore. Several other movements of ice occurred in the North branch on the 9th, and as these movements indicated a general break up of the ice gorges warnings were sent to Selinsgrove and other points below Sunbury to the effect that in case a general break occurred a disastrous flood might

be expected. The wires to Catawissa and Bloomsburg went down during the afternoon. The ice started at Danville about 3:30 p. m. of the 9th, carrying away the bridge at that point. About 5 p. m. the ice began to move at Wolverton, a few miles above Sunbury, and at 8 p. m. the observer at Sunbury reported the ice running between Sunbury and Catawissa and passing out of the North branch on a high flood. Later reports, however, showed that only that portion of the great gorge between Sunbury and Boyds passed out, and that the gorge above was still holding. The ice flood carried away three spans of the wooden wagon bridge at Sunbury, between Packers Island and Northumberland soon after 8 p. m., but did no damage to the steel bridges of the Pennsylvania and Philadelphia and Reading Railroad companies. These bridges were weighted with heavy trains of cars loaded with pig iron.

The spans of the wrecked bridges above were swept down on the ice flood and crashing against the Pennsylvania Railroad bridge were mashed to pieces, the broken timbers passing under the structure. Several large pieces of the spans of the wrecked Danville and Northumberland bridges passed Harrisburg between 7 and 8 a. m. of the 10th. The excitement was great at Harrisburg when it became known that the ice flood was coming out of the North branch on the evening of the 9th. It required the entire time of one observer to answer inquiries on the telephone. It was announced that the Weather Bureau office would remain open all night, if necessary, or in any case until it was known that there would be no danger at points below Sunbury. As the 10 p. m. and midnight reports from Selinsgrove and Sunbury showed that only a section of the great gorge had moved and that no danger threatened, the office was closed at 2 a. m. on the 10th. A section of the gorge between Boyds and Rupert moved out at 2 p. m. on the 10th, causing the river at Catawissa to fall 14 feet and improving the situation at Bloomsburg, where the water fell at the rate of about six inches an hour during the afternoon. A section of the gorge from Rupert to a distance of about three hundred yards above Bloomsburg Bridge moved out about noon on March 11 without destroying the Bloomsburg Bridge, which settled back on its piers. The river at Bloomsburg registered 24 feet when the ice began to move, and fell to 12 feet shortly after the movement occurred; the ice was reported to be 6 feet thick when it started. No further movement of ice was reported until March 21, when the gorge above Wilkesbarre began to disintegrate and move past Wilkesbarre. A portion of the gorges in the Susquehanna and Chenango rivers, near Binghamton, moved out during the afternoon of the 24th. The ice at Bloomsburg, which was near the center of the great gorge, began to move at 7:05 p. m. on the 24th, and the gorge broke at Creasy at 3:30 a. m. of the 25th. This gorge, which began about three hundred yards above the Bloomsburg Bridge, moved out quietly, without damage, the piers of the Bloomsburg Bridge cutting it nicely. The ice from these gorges began to pass Harrisburg about 3 p. m. of the 25th, about three-fourths of the river's surface being covered.

It is impossible to estimate with any degree of accuracy the damage done by ice floods in the Susquehanna River during the months of January, February, and March. The amount of damage sustained has been given by some newspapers at from $2,000,000 to $6,000,000 in the North branch. The loss in bridges alone probably exceeds a million dollars. The loss to railroads and electric lines was very great, thousands of additional laborers being required to clear the roadways of ice. The loss in property at Middletown has been estimated at from $60,000 to $75,000, and the loss in property from Sunbury to Wilkesbarre was very great.

From January 24, the day the gorge formed at Bloomsburg, until it was known that all danger had passed, every effort was made by this office to impress on the people, by bulletins and through the newspapers, the gravity of the situation, and the fact that not a single life was lost, although some narrow escapes from death occurred, is evidence that the repeated warnings were heeded by the public.

Floods of considerable magnitude occurred from the 25th to the 27th, inclusive, in the valleys of the Mohawk and Hudson rivers, caused by the breaking up and gorging of the large amounts of ice that had accumulated during the exceptionally severe winter. Considerable damage was done to property interests along the river, bridges were injured and railroad traffic much delayed. Timely and accurate warnings were issued and were the means of saving a large amount of property. The press and public were most liberal in their praises of the River and Flood Service maintained by the Weather Bureau.

In the Pittsburg district, flood stages were reached on March 1 and 2, also on the 7th and 8th, due to heavy rains and the rapid melting of the snow in the territory drained by the Allegheny and Monongahela rivers. Warnings were issued well in advance of the expected rises, and no damage of consequence was reported.

In the Mississippi and Missouri rivers, no extremely high water occurred. From the 15th to the close of the month there was a gradual rise in both rivers, and in a few cases the danger line was reached, but there were no losses of importance.

During the first week of the month, considerable damage was caused by floods in the Sandusky River, in northern Ohio, particularly in the vicinity of Fremont. Flood stages were also reached in the Muskingum River, in southeastern Ohio from the 4th to the 6th.

There were also floods of considerable importance in the White and Wabash rivers of Indiana, during the latter part of the month. The damage was especially heavy at Indianapolis and vicinity, where many thousands of dollars worth of property was destroyed. These floods were caused by the excessive rains over the territory embraced in the above-named rivers and their tributaries.

One of the most destructive floods of the month occurred in Michigan, along the Grand, Shiawassee, and Kalamazoo rivers and their tributaries. The heavy rains and the sudden rise in temperature caused the rapid melting of the accumulated snow, and the rivers were quickly filled beyond their capacity, with the consequent flooding of all property interests along their courses. Very heavy losses are reported from Grand Rapids, Bay City, Saginaw, and in fact from all cities and villages in the district drained by the above-mentioned rivers. Bridges were washed away, railroad right of way destroyed, factories flooded, and all property in the basins of these rivers more or less injured.

Another destructive flood of March occurred in the valleys of the Sacramento and San Joaquin rivers of California. A description of this flood prepared by Prof. A. G. McAdie, official in charge, United States Weather Bureau office, San Francisco, Cal., follows:

The month of March, like the month of February, was one of excessive precipitation, and the additional water, augmenting the already large volumes in the basins of the lower Sacramento Valley, caused heavy floods and considerable loss to the farming industries of the Yolo, Sacramento, and lower San Joaquin basins.

Staten, Tyler, Bouldin, Jersey, and Sherman islands were flooded. Ryer Island was saved by untiring work upon the part of those in charge, but the water rose to within a few inches of the top of the levee, and the washing was so considerable that an inspection made on March 30 made it plain that a few hours more of strong wind would undoubtedly have broken the levees. Grand Island stood the strain well; but had Ryer Island gone under, it is an open question whether the rush of the water would not have endangered Grand Island, also.

The break on Sherman Island undoubtedly contributed to the escape of Brannan, Twitchell, and Andrus Island.

On February 26 the levee on the east bank of the Sacramento River, about 4 miles south of the city of Sacramento was broken. This break, which is known as the Edwards Break, originally about 100 yards in width, steadily increased, notwithstanding attempts to close it, and was fully 1500 feet wide during the latter part of February and entire month of March. The effect of this break was to relieve the pressure upon the levees at the city of Sacramento; but, on the other hand, brought about the flooding of thousands of acres of valuable crops. The water poured southward and flooded the entire country east and south to Disappointment Slough. The Pierson district, probably because of excellent levees, escaped. Thus, the water of the Sacramento River, leaving its own channel, passed into the San Joaquin by way of the Mokelumne. The flooding of Bouldin Island, about 3000 acres of which was under a high state of cultivation, was thus traceable to the Edwards Break. The asparagus crop of California, that was almost ready for the canneries, is said by Prof. R. E. Smith, of the University of California, to have been damaged by the floods as follows: 2000 acres Bouldin Island, 400 acres Staten Island, 300 acres Jersey Island, or, in general, about one-half of the asparagus crop devoted to canning.

Venice and Mandeville islands are not wholly reclaimed. Roberts, Union, and the other islands on the lower San Joaquin escaped injury because of the comparatively low stage of the San Joaquin and its tributaries.

A vast amount of grain land contiguous to the river was overflowed, especially in the Colusa, Butte, American, and Yolo basins. In all, probably 50,000 acres of valuable grain land were flooded. One of the most serious breaks occurred in the Colusa basin, on the west bank of the Sacramento River, at Princeton. A large portion of the Yolo basin continued under water for many weeks. Some of the best fruit land, especially for early cherries, on the east bank of the Sacramento River, back of Courtland and south to Walnut Grove, was covered with water

to the depth of 10 feet or more. In all, it is probably safe to estimate that nearly half of the total area of the islands, or about 55,000 acres, and also 50,000 acres of grain land, as stated above, were flooded.

The highest and lowest water, mean stage, and monthly range at 202 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*C. C. Cooper, Weather Bureau.*

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Service Divison.

The following summaries relating to the general weather and crop conditions during March are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—Prevalent warm and generally dry weather was favorable for preparatory work and for germination and growth, except in northern counties where too much rain fell; much upland corn planted, some up to good stands; some cotton planted; nearly all early vegetables up to good stands; strawberries beginning to ripen; peaches in northern counties were damaged by the freeze of the 27th and 28th, but otherwise fruit prospects continued good.—*F. P. Chaffee.*

Arizona.—Dry weather continued until the early part of the third decade, when the drought was relieved slightly by rain and snow. High temperatures prevailed during the first two decades, but there was considerable cold weather, with damaging frosts, during the third decade. Crops did well in the lower Colorado Valley, but elsewhere did not thrive, and the prospect was discouraging at the end of the month. Range stock suffered greatly from insufficient feed and water.—*M. E. Blystone.*

Arkansas.—First of month favorable for farm work; some corn and potatoes were planted and small grain sown in southern portion, and came up to good stands; excessive rains latter part caused suspension of all work; fall grains doing well; very little ground prepared for cotton and none planted; peaches and plums in blossom; some peaches in extreme northern portion of the State damaged by cold weather, but generally fruit suffered no material injury from cold weather.—*Edward B. Richards.*

California.—Heavy rains continued the greater part of the month in central and northern sections, with abundant snow in the mountain districts and lighter rainfall in the southern sections. Great damage was caused by high waters in the Sacramento and northern San Joaquin valleys. Thousands of acres of valuable grain lands and rich asparagus fields were flooded, and replanting will be impossible in many cases. High winds on the 9th and 10th also caused much damage to orchards and farm buildings.—*Alexander G. McAdie.*

Colorado.—Soil too dry in eastern counties until rain and snow at close of month; plowing about half finished elsewhere. Dryness and high winds delayed seeding and damaged winter grain. Fruit trees were far advanced, and were injured somewhat by cold near close of month. Considerable snow fell in mountain districts, materially increasing the store of moisture; springs are revived, a good waterflow is indicated for the early season, and the late flow will probably be somewhat increased—*F. H. Brandenburg.*

Florida.—Warm and mostly dry weather characterized the month. Farm work was well advanced. The early corn was worked. The bulk of the cotton crop was planted during the last decade; some early seeding was chopped; planting continued, however, at the close of the month, and the acreage will be materially increased. Pineapples suffered from the dry weather, and much citrus bloom was lost. Strawberries were plentiful and vegetable shipments active.—*A. J. Mitchell.*

Georgia.—The month was characterized by generally warm weather and light rainfall, the average precipitation being the lowest on record for March. Frequent rains in the northern section retarded farm work; elsewhere planting was well advanced at the close of the month. Corn planting was general in central and southern districts. Cotton seeding was confined to the southern half of State. The peach crop was injured but little, if at all, by frost.—*J. B. Marbury.*

Idaho.—The temperature was slightly below the normal, while the precipitation average was the greatest on record for any month; snow in the mountains attained an unusual depth, roads in valleys were very muddy throughout the month, and little farm work was done. Trees, hay crops, and winter grain were reported in excellent condition. Range grass started well; stock mostly in fair condition, though there was some loss of sheep from heavy rain and snow.—*Edward L. Wells.*

Illinois.—Wheat showed decided improvement, having reached nearly average development in the southern district, where the crop was least promising during the winter. Rye was in a thrifty stage. The season was very backward and the soil too wet for spring plowing. Only a few fields had been sown with oats. Pastures and meadows were generally promising. Peach buds were conceded to be mostly killed or injured, but other fruits, especially apples, were believed to be unscathed.—*Wm. G. Burns.*

Indiana.—Wheat improved during the month and was generally in fair condition at the time of the occurrence of excessive rains on March 25–26, which badly washed all fall sown crops on rolling and hill lands and flooded those on creek and river bottoms. * At the close of the month the bottoms of the lower reaches of the White and Wabash rivers were still flooded and the entire loss of a large acreage of wheat seemed probable.—*W. T. Blythe.*

Iowa.—March was a typical spring month, in respect to temperature and precipitation, with less than the usual number of severe storms; but conditions were generally unfavorable for seeding and other field work. In a few favored localities oat and spring wheat seeding was begun. The ground was frozen to an unusual depth, and the frost yielded slowly, leaving the surface quite wet. Farm stock doing well. Fall wheat and rye damaged.—*John R. Sage.*

Kansas.—Wheat improved rapidly in eastern, less rapidly in central, and was poor in western counties. Oats were sown and coming up in southern districts and sowing had progressed in the central and begun in the northern counties. Plowing was completed in the southern and was progressing in the central counties. Corn planting had progressed well in the southeastern counties and had begun in the central-eastern. Peaches, apricots, pears, and plums were blooming in the southern counties.—*T. B. Jennings.*

Kentucky.—The rainfall averaged considerably above normal for the month. In some localities it was very heavy, causing considerable damage to crops by washing and flooding. The temperature was slightly above normal. The outlook for fruit was quite good. Wheat had improved considerably, but was still unsatisfactory. Tobacco beds were sown and plants were coming up in the early ones at the end of the month. Grass was starting well. Farm work was late.—*H. B. Hersey.*

Louisiana.—Occasional showers well distributed over the State proved exceptionally favorable for farming interests. Preparations for the cotton crop were unusually well advanced and planting was well under way over the southern portion of the State. Sugar cane was doing well, except that fall planting was backward. Rice seeding was being pushed forward. Corn was coming up to good stands and early planted was being cultivated. Berries are of good quality and the crop is heavy. Trucking interests were well advanced.—*I. M. Cline.*

Maryland and Delaware.—Temperature and sunshine were below normal; precipitation was slightly deficient, though rainy days were in excess. The ground was frozen until the last decade and then too wet for plowing, except on uplands. The weather was favorable for grain and grasses, which made great improvement generally, and for care of last year's tobacco. Late wheat was in very poor condition. Some potatoes, peas, and gardens were planted, and clover seeding was nearly completed.—*Oliver L. Fassig.*

Michigan.—Winter wheat and rye seemed to have wintered fairly well. At the close of the month wheat and rye tops were somewhat brown, but the roots were apparently healthy; on low, heavy land excessive moisture damaged wheat. Fruit buds as far as could be determined were generally in good condition. At the close of the month frost was still in the ground and field work had not begun.—*C. F. Schneider.*

Minnesota.—Coldest weather occurred generally on the 3d, when all minimum temperatures were below zero; temperatures were again below zero in northern counties as late as the 27th, but the weather was less severe from the 6th to the 26th. Precipitation occurred on many days; the northern districts were covered with snow the entire month, and the southern until the 24th. A little wheat was sown on light high lands in the southwestern and central-western districts on the 31st.—*T. S. Outram.*

Mississippi.—Conditions were very favorable, except heavy rains north during the last decade, and frosts on the 27th and 28th. Farm work was unusually well advanced, except in the extreme northeastern counties, where labor was scarce. Oats did well. Much corn was planted and some was up to good stands in the southern counties. Cotton planting began. Garden truck and fruit were generally promising, although damaged somewhat by frosts north. Vegetables and strawberries were being shipped from the south.—*W. S. Belden.*

Missouri.—The month was generally favorable for winter wheat, which improved decidedly in nearly all sections. In the southwestern counties oats were nearly all sown, considerable plowing was done for corn, and a little corn was planted up to the 24th, but elsewhere very little farm work was done, the soil being too wet. Excessive rains in the southeastern counties on the 24–25th washed fields badly and caused floods which did much damage to crops and property.—*A. E. Hackett.*

Montana.—The coldest weather occurred in the first and last decades;

moderate temperates for the most part from the 5th to 22d. Precipitation mostly snow and much in excess of normal. Many ranges were covered most of month and blizzards occurred on several dates; stock interests suffered accordingly, but month closed more favorable. Much feeding necessary latter half of month, as ranges, where clear of snow, are short. Abundance of water for irrigation promised in all sections.—*R. F. Young.*

Nebraska.—March was warm and dry. The soil in the western counties was rather dry for seeding, but in the central and eastern counties it was in excellent condition. Considerable winter wheat was sown the latter part of the month, and oat seeding was general in central and southern counties. Winter wheat started nicely except in western counties, where the crop was in a decidedly unsatisfactory condition owing to dry weather during and since the time of seeding.—*G. A. Loveland.*

Nevada.—Weather mild and generally cloudy, with frequent rains in northern and western sections; in the eastern, central, and southern districts the precipitation was below normal. Plowing and seeding were in progress in southern and western sections toward the latter part of the month. Range feed starting nicely and stock in good condition generally. Outlook unusually favorable for a good flow of water until late in season.—*J. H. Smith.*

New England.—Weather was generally favorable for outdoor work. Month closed with ground generally bare of snow, except in protected places in the woods, although frost was not out except in some extreme southern sections. Fall grain and grass wintered well. The maple sugar season was later than usual, with fair prospects. Plowing had begun in some of the southeastern sections of the district. The water famine continued in northern sections of New Hampshire and in western Maine.—*J. W. Smith.*

New Jersey.—The month was characterized by hard freezing weather and frequent thaws; farm work was generally behindhand. A few early potatoes and peas were planted on light soils in the southern section. Winter grain was generally below average condition, some low fields having been scalded. Peach buds in southern section, and in some places in northern section, were largely winter killed.—*Edward W. McGann.*

New Mexico.—Drought practically continuous since last September, but northern mountains received a good snow on the 31st, more than fell during all the previous winter. Southern ranges dry and cattlemen losing stock. Moisture badly needed for approaching lambing season. Late frosts slightly damaged southern orchards.—*R. M. Hardinge.*

New York.—First half of month cold and windy, but latter half mild; frost leaving ground rapidly; ground bare in warmer sections, but snow 3 feet deep in parts of Adirondacks; wheat and rye damaged; considerable grass winter killed; peach buds killed to large extent; maple sugar harvest begun; generally no farm work done.—*R. G. Allen.*

North Carolina.—The slight excess in temperature during March was the first to be recorded in North Carolina in six months. This condition was favorable, but frequent light rains kept the soil too wet to plow in many districts. Winter wheat improved somewhat and began to show above the ground green and vigorous. Winter oats remained poor. Some spring oats were sown and came up nicely. Preparations for truck crops were commenced very late. Strawberries appeared to have wintered well.—*C. F. von Herrmann.*

North Dakota.—March gave about average weather conditions, except that the winds were higher than usual. An especially severe storm on the 24th and 25th caused considerable loss of stock, and several lives were also lost. Owing to heavy snows in the western portion, stock grazing on the ranges was seriously interfered with. The month closed with the ground deeply frozen and, as a rule, covered with snow.—*B. H. Bronson.*

Ohio.—The temperature averaged practically normal over the State. The highest temperature occurred generally on the 22d, and the lowest on the 4th. The precipitation was considerably in excess of the normal, much damage being done in some sections by high water. Early sown wheat is generally better than late sown, but the outlook is everywhere below the average. Apple and pear trees are in good condition, cherries, plums, and berries somewhat injured, and peaches badly winter killed.—*J. Warren Smith.*

Oklahoma and Indian Territories.—Cold waves the 3d–4th and 26–28th, remainder of month excessively warm; warmest March on record; general rains on 24th; wheat over central and eastern divisions in fair to good condition, over western division generally poor; oat seeding well advanced and coming up to good stand in some localities; corn planting progressing; early potatoes planted and coming up; cotton ground being prepared, with increased acreage; fruit badly damaged by freezing over Oklahoma, but no damage over Indian Territory.—*C. M. Strong.*

Oregon.—Cold, wet weather prevented spring plowing, seeding, and gardening. Fall wheat was thin and stunted from lack of warmth and sunshine, but was well rooted and healthy. Inclement weather, backward pasturage, and scarcity of feed caused some loss of young cattle and lambs. Fruit trees escaped winter injury; but few blooms had appeared at the close of the month—a favorable feature owing to decreased liability to frost damage with a backward season and late bloom.—*Edward A. Beals.*

Pennsylvania.—Alternate periods of freezing and thawing were unfavorable for grain. At the close of the month surface conditions indicated that wheat and rye were materially injured, but no accurate estimate of damage to roots could be formed at such an early date. Very little plowing had been done, and there was much frost in the ground in nearly all sections. The consensus of opinion was that peach buds had suffered more than any other fruit.—*T. F. Townsend.*

Porto Rico.—Dry weather throughout the southern division until the last week materially injured young canes and pasturage; elsewhere ratoons and small crops suffered somewhat, and the grade of cane juice was below normal, owing to too much rain. Grinding continued with slight interruption, and much cane was planted. The second blossoming of coffee occurred during the month; orange trees were blossoming.—*E. C. Thompson.*

South Carolina.—Preparation of land made satisfactory progress, and much corn, some rice, a little cotton, minor crops, and gardens were planted in the eastern half. Winter wheat and oats improved during the warm periods, reaching fair condition. Spring oats came up to good stands. Fruit trees generally finished blooming and set full crops of peaches, pears, and plums. Tobacco plants in beds were healthy, though small. The weather favored truck, and shipments of early vegetables were begun.—*J. W. Bauer.*

South Dakota.—Month drier and a little warmer than usual. Because of cold nights, frosty ground, and considerable high wind, comparatively little seeding or preparatory field work was done, except in the extreme southeastern portion of the State. Winter rye and the very limited amount of winter wheat sown were generally reported in favorable condition. There was some loss of cattle early in the month on the open ranges in the northwestern portion of the State.—*S. W. Glenn.*

Tennessee.—Fairly mild weather, with sufficient moisture, during the greater part of the month favored the growth of vegetation and early sown winter grain. Spring oats, clover, and grass made good progress; wheat improved decidedly. Plowing was somewhat delayed by rainy weather. Damaging winds and rains were followed by a cold wave, with frost, during the last decade, which injured fruit slightly.—*H. C. Bate.*

Texas.—Temperature conditions were generally favorable during the month. Cool waves occurred on the 3d and 4th, 13th and 14th, and 27th and 28th. The first one gave freezing temperatures as far south as Williamson County and the two latter light frosts down to about the same region. Good to heavy rainfall occurred over the northeastern portion between the 17th and 26th, but other sections received only light showers during the month. Cotton planting progressed in all sections, and by the close of the month half of the crop had been planted in some of the southern counties. The early planted came up nicely, but was killed by frost in some localities in the northern and middle portions. The planting of early corn was completed and good stands generally secured. Wheat, barley, oats, and rye were in good condition in the eastern half, but west of the ninety-eighth meridian grain had been badly damaged by drought. The fruit crop was generally in good condition.—*L. H. Murdoch.*

Utah.—Excessive precipitation occurred over the north half of the State, where the ground was too wet to work. Grass and fall grain were making a fine start. Southward the precipitation decreased rapidly and active farming operations had begun. Much of the spring grain was up, and lucerne had made a splendid growth. Some early fruit in unprotected orchards was injured by freezing. Irrigation water will be plentiful except on some southern farms.—*R. J. Hyatt.*

Virginia.—Winter wheat and oats entered the month in rather poor condition, especially the latter, which was much winter killed. The change toward a more normal condition of temperature that occurred during the month was very beneficial to all fall sown crops, and a slow but steady improvement resulted. Farm work generally was much behindhand, more particularly plowing and other preparations for spring seeding.—*Edward A. Evans.*

Washington.—Excessive rains in western division prevented farm work; unusually heavy snowfall in eastern division, with much still on ground, hindered spring operations. Fall wheat backward on account of late spring, but generally wintered well and has good stand; winter wheat yellow and sickly in parts of western division because of continuous rains. Fruit prospects thought to be unimpaired; trees not blossomed yet. Surplus moisture in soil expected to result beneficially to crops.—*G. N. Salisbury.*

West Virginia.—The mild weather and good showers during the fourth week started vegetation, and at the close of the month grass was turning green and fruit buds were beginning to swell. Farm work was behind, but some plowing had been done, and some potatoes planted in the southern section. Wheat, rye, oats, and grass were in very poor condition. The late freeze did little damage, as fruit was backward.—*E. C. Vose.*

Wisconsin.—The month was unusually cold, and while most of the snow disappeared during the third decade, the ground remained frozen except in the southern counties until the close of the month. Winter grains and grasses appeared to be in good condition, having been protected from the cold during the winter by an ample covering of snow. Preparations for spring work were under way, but practically nothing had been accomplished.—*W. M. Wilson.*

Wyoming.—The month of March, like the three preceding months, was

mild. The winter was unusually favorable for the stock interests of Wyoming, and in many sections the losses were exceedingly small. An ample amount of snow over the western and northern sections of the State, assures a good water supply for the coming summer in those sections. Over the southeastern part the supply of snow was deficient, and a shortage of water was anticipated.—*W. S. Palmer.*

SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS, MARCH, 1904.

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.								Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.						Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	58.2	−3.0	Clanton	89	22	Oneonto	23	9	3.69	−2.20	Madison	8.50	Clanton	1.05
			Dothan	89	24									
Arizona	57.2	+3.2	Champies Camp	105	8	Flagstaff	0	24	0.28	−0.49	Flagstaff	1.39	6 stations	0.00
Arkansas	55.4	+3.2	Amity, Ozark	90	21	Pond	12	4	5.64	+0.42	Witt Springs	8.47	Pond	1.88
California	51.1	−0.9	Salton	98	7	Bodie	−12	12	8.52	+4.33	Bowmans Dam	39.51	4 stations	0.00
			Volcano Springs	98	7									
Colorado	38.1	+4.4	Lamar	84	2	Antelope Springs	−17	26	1.35	−0.18	Ruby	6.65	Lamar	0.61
Florida	67.5	+2.8	Macclenny	94	22	Tallahassee	30	16	1.62	−1.76	Bonifay	4.00	Flamingo	T.
						Wausau	30	5						
Georgia	57.8	+2.4	Jesup	92	23	Clayton	22	16	2.73	−2.33	Clayton	6.64	Americus	0.83
						Tallapoosa	22	28						
Idaho	34.7	.....	Pollock	73	24	Lake	−14	24	4.37	.....	Hailey	7.73	Milner	1.32
Illinois	40.0	+0.9	Plum Hill	80	31	Lanark	9	4	6.20	+2.71	Mt. Carmel	12.84	Lanark	2.68
Indiana	40.7	+1.5	Madison, Washington.	80	24	Valparaiso	11	3	8.09	+4.32	Washington	13.73	Topeka	3.22
						Angola, South Bend	11	4						
			Rome	80	31	Crawfordsville	11	4						
Iowa	34.8	+2.4	Ottumwa	78	23	Columbus Junction	−3	3	2.19	+0.35	Bedford	4.57	Ida Grove, Sioux C'y	0.50
Kansas	46.9	+4.9	Sedan	93	2	Wallace	−4	3	1.45	−0.13	Fort Leavenworth	4.24	4 stations	T.
Kentucky	47.7	+1.5	Mayfield	88	21	Anchorage	12	4	6.26	+1.15	Owensboro	8.99	Williamsburg	3.78
Louisiana	64.2	+3.9	Franklin	90	31	Calhoun	24	4	4.22	−0.61	Collinston	6.78	Jennings	2.00
			Robeline	90	2									
Maryland and Delaware	41.2	−0.8	Boettcherville, Md	87	25	Oakland, Md	5	17, 18	3.04	−0.63	Cambridge, Md	4.24	Westernport, Md	1.13
Michigan	28.1	−0.5	Adrian	70	31	Humboldt	−31	4	3.19	+1.00	South Haven	7.32	Mancelona	0.42
Minnesota	24.8	+0.1	La Verne	63	24	Pokegama Falls	−41	4	1.51	+0.05	Mount Iron	3.72	Pipestone	0.08
Mississippi	60.2	+3.4	Port Gibson	89	22	Corinth	21	4	5.18	−0.60	Duck Hill	8.77	Macon	2.25
Missouri	44.8	+2.5	Dean	87	21	Montreal	8	4	4.14	+0.89	Ironton	11.49	Lamar	1.48
Montana	25.1	−4.5	Lame Deer	63	7	Wolsey	−36	26	1.90	+0.98	Troy	4.51	Boulder	0.61
Nebraska	38.8	+4.3	Alma	84	18	Agate	−7	3	0.53	−0.57	Fairbury (near)	2.69	5 stations	T.
			Fairbury	84	28									
Nevada	39.7	+3.0	Sodaville	80	19	Ely	0	23	1.69	+0.11	Lewer's Ranch	9.10	Fallon	T.
						Geyser	0	24						
New England*	30.2	−0.8	Chestnut Hill, Mass.	71	26	Fort Fairfield, Me	−23	4	2.79	−0.73	Bar Harbor, Me	5.37	Fort Fairfield, Me	0.95
New Jersey	37.2	−1.1	Barnegat, Tuckerton	72	26	Charlotteburg	1	5	3.43	−0.73	Imlaystown	4.76	Pleasantville	2.02
New Mexico	47.6	+3.7	Carlsbad	91	2	Winsors	5	13	0.19	−0.22	Fort Wingate	1.40	12 stations	0.00
New York	29.8	−1.4	Appleton	66	25	Indian Lake	−25	5	3.13	+0.10	Adams Center	6.24	Plattsburg	0.20
			Primrose	66	26									
			Ripley	66	22									
North Carolina	50.5	+1.9	Rockingham	85	20	Linville	14	29	4.11	−0.50	Horse Cove	8.14	Rockingham	2.13
North Dakota	18.0	+6.9	Fort Yates	64	1	Milton	−28	3	1.33	+0.38	Pembina	2.24	Ellendale	0.30
Ohio	39.7	+0.8	Thurman	86	25	Hilihouse	−1	4	5.73	+2.35	Green	8.84	Philo	2.44
Oklahoma and Indian Territories.	56.1	+5.9	Healdton, Ind. T	99	21	Binger, Chandler, Okla.	10	4	2.17	−1.08	Coalgate, Ind. T	4.60	3 stations	0.00
Oregon	40.3	−2.0	Pendleton	75	7	Joseph	7	2	8.85	+4.73	Buckhorn Farm	26.47	Riverside	0.60
Pennsylvania	36.0	−10.4	Johnsto'n, Uniontо'n	80	25	Dushore	−2	17	4.29	+0.53	Beaver Dam	7.02	Scranton	2.10
Porto Rico	73.2	.....	Bayamon	95	9	Adjuntas	50	4	7.38	.....	Cidra	19.45	Santa Isabel	2.76
			Manati	95	20	Caguas	50	14						
South Carolina	56.2	+1.6	Blackville	87	1	Greenville	23	16, 17	3.42	−0.41	Walhalla	5.52	Charleston	1.54
South Dakota	31.0	+3.0	Armour	76	24	Leola	−18	3	0.37	−0.99	Leola	1.50	3 stations	T.
Tennessee	51.4	+2.9	Franklin, Iron City	83	22	Rugby	13	4	6.24	+0.56	Sewanee	10.08	Bristol	3.10
			Lebanon	83	22									
			Rogersville	83	25									
Texas	64.8	+5.9	Cotulla	106	11	Amarillo	15	3	1.05	−1.17	Arthur City	6.02	28 stations	0.00
Utah	39.9	+1.6	Green River	90	14	Ranch	−10	22	2.33	+0.91	Park City	7.85	2 stations	T.
Virginia	45.7	−0.1	Cape Henry	80	26	Burkes Garden	11	4	3.08	−0.81	Big Stone Gap	5.20	Richmond	1.28
						Hot Springs	11	28						
Washington	38.0	−3.0	Mottingers Ranch	70	7	Republic	−4	2	5.09	+2.61	Clear Water	18.33	Ephrata	0.59
West Virginia	43.8	+2.6	Logan	86	22	Ryan	7	4	4.12	+0.93	Pickens	6.10	Moorefield	1.38
Wisconsin	28.0	−0.8	Beloit	60	24	Butternut, Hayward	−24	4	2.36	+0.41	Milwaukee	5.46	Grantsburg	0.65
Wyoming	30.1	+2.1	Fort Laramie	70	18	Daniel	−26	3	2.13	+0.10	Battle	9.10	Pine Bluff	T.
			Pine Bluff	70	18									

*Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

SPECIAL ARTICLES.

THE DIMINUTION OF THE INTENSITY OF SOLAR RADIATION DURING THE YEARS 1902 AND 1903 AT WARSAW, POLAND, RUSSIA.

By LADISLAS GORCZYNSKI.

[Translated from Comptes Rendus, Paris, February 1, 1904. T. CXXXVIII, pp. 255-258.]

In his communication of the 26th of March, 1903, M. Henri Dufour was the first to announce the fact that the intensity of the solar radiation, as received at the surface of the earth, had experienced a considerable diminution since the beginning of the year 1903.[1]

Basing his conclusions on the observations that had been made at Lausanne and at Clarens[2] with the Crova actinometer,

[1] This fact was also announced independently by Mr. H. H. Kimball, as the result of his own observations at Asheville, N. C., during the years 1902 and 1903, but his publication of the fact was delayed a short time. See his note in Monthly Weather Review, May, 1903, p. 232, which article was communicated for publication on April 15, 1903. This fact had also been simultaneously observed at Washington at the Astrophysical Observatory of the Smithsonian Institution. See article by Mr. C. G. Abbot, Monthly Weather Review, December, 1903, p. 587. Similar irregularities had also been pointed out by Mr. Abbot in the Monthly Weather Review, April, 1902, p. 178, as revealed by observations at Montpellier, France.—ED.

[2] On the northeast shore of Lake Geneva, 20 miles east-southeast of Lausanne.

Dufour finds that the diminution of intensity began in December, 1902, that it increased up to March, 1903, and then gradually diminished.

The existence of an unusual atmospheric opacity for several months is also confirmed by the measurements made by A. Gockel[3] (Met. Zeit., 1903, p. 328) and also by the observations of Max. Wolf[4] at Heidelberg (Vierteljahrschrift d. Astron. Gesellschaft, Year 38, part 2). Finally, the diminution of the transparency of the layers of air is also confirmed by S. P. Langley at Washington (Nature, LXIX, p. 5, November 5, 1903).

The diminution of intensity of solar radiation as measured at the surface of the globe has also been confirmed at Warsaw, where systematic observations have been made since December, 1900, with an actinometer of the Ångström-Chwolson pattern. The result of these measurements, undertaken for the purpose of studying and explaining the annual variations of insolation, have been published, in so far as concerns the years 1901 and 1902, in the "Etudes sur la marche annuelle de l'insolation" (Bulletin Internat. de l'Acad. des Sciences de Cracovie, p. 465–503, July, 1903). In this present communication, I will cite only those numbers for the years 1901, 1902, and 1903 that serve to demonstrate the fact of the diminution of intensity with which we are at present concerned.

I present in Table 1 the monthly means of the intensity at Warsaw, expressed in gram calories per square centimeter per minute, accompanied by the corresponding monthly values of the absolute humidity. With these means is given also, in Table 2, the maximum values of the intensity of the radiation (reduced to the average altitude of the sun at Warsaw at the middle of each month) for each consecutive month during the period 1901–1903, inclusive. The last three columns of Tables 1 and 2 indicate the differences between preceding and following years, e. g., 1902 minus 1901 and 1903 minus 1902; these differences are reduced to a common absolute humidity by the use of the coefficient of reduction to a standard humidity, namely, $\Delta = 0.02$.

TABLE 1.—*Average insolation and absolute humidity observed at Warsaw.*

Month.	1901. Monthly means.		1902. Monthly means.		1903. Monthly means.		Differences.		
	Insolation.	Absolute humidity.	Insolation.	Absolute humidity.	Insolation.	Absolute humidity.	1902 minus 1901.	1903 minus 1902.	1903 minus 1901.
January	1.04	3.7	0.95	4.1	0.80	3.0	−0.08	−0.17	−0.25
February	1.29	2.3	1.16	3.3	0.92	3.9	−0.11	−0.23	−0.34
March	1.25	5.3	1.33	4.3	1.03	5.9	+0.06	−0.27	−0.21
April	1.40	5.7	1.36	4.3	1.11	5.6	−0.01	−0.22	−0.23
May	1.38	7.8	1.26	6.2	1.08	7.9	−0.15	−0.15	−0.30
June	1.36	13.2	1.22	7.1	1.21	9.2	−0.26	+0.03	−0.23
July	1.36	11.5	1.24	8.8	1.12	10.5	−0.19	−0.07	−0.26
August	1.28	12.4	1.19	9.0	1.08	12.1	−0.15	−0.05	−0.21
September	1.32	9.5	1.24	7.3	1.07	9.1	−0.12	−0.13	−0.25
October	1.23	8.6	1.09	4.2	1.01	7.2	−0.23	−0.02	−0.23
November	1.13	3.7	0.96	3.0	*	*	−0.18	*	*
December	1.09	5.6	0.79	1.9	0.71	2.1	−0.37	−0.08	−0.45
Year	1.29	8.5	1.15	5.6	0.96	7.3	−0.20	−0.16	−0.36

From the examination of these tables it results that a very considerable diminution in insolation began at Warsaw in the month of May, 1902 (consequently earlier than December, 1902), and persisted month by month during this year and the following, attaining a maximum diminution in the spring of 1903. Toward the end of this latter year, the process of diminution, compared with the figures for 1902, seems to have stopped, but the absolute values continue to be low compared with those of 1901. The cause of the increase in the opacity of the atmosphere for solar radiation is not as yet clear. Dufour correlates this fact with the recent eruption at Martinique, but the extraordinary dust showers that have many times visited Europe during these three years also suggest themselves as a possible cause. However, these can only at present be suppositions whose correctness can not yet be demonstrated, because of the want of more complete and positive data.

TABLE 2.—*Maximum insolation observed at Warsaw, and accompanying absolute humidity*

Month.	1901.		1902.		1903.		Differences.		
	Insolation.	Absolute humidity.	Insolation.	Absolute humidity.	Insolation.	Absolute humidity.	1902 minus 1901.	1903 minus 1902.	1903 minus 1901.
January	1.06	3.8	0.99	5.0	0.89	1.9	−0.05	−0.16	−0.21
February	1.41	1.8	1.30	2.6	0.96	2.6	−0.09	−0.34	−0.43
March	1.28	3.7	1.50	1.7	1.08	5.1	+0.18	−0.35	−0.17
April	1.50	4.7	1.47	3.4	1.11	5.6	−0.06	−0.32	−0.38
May	1.51	4.5	1.32	4.3	1.12	4.8	−0.19	−0.19	−0.38
June	1.46	7.1	1.34	7.9	1.25	9.6	−0.10	−0.06	−0.16
July	1.45	8.2	1.37	6.2	1.22	8.8	−0.12	−0.10	−0.22
August	1.38	12.4	1.28	6.5	1.09	12.9	−0.22	−0.06	−0.28
September	1.37	7.8	1.39	4.0	1.13	7.1	−0.06	−0.20	−0.26
October	1.36	5.0	1.19	4.2	1.13	8.7	−0.19	+0.03	−0.16
November	1.18	4.1	1.03	1.7	*	*	−0.20	*	*
December	1.13	3.0	0.83	2.6	0.80	3.3	−0.31	−0.02	−0.33

* During the month of November, 1903, there was not a single day at Warsaw clear enough to permit actinometric measurements.

The following additional observations on this subject are added for the information of the reader.—ED.

In the Meteorologische Zeitung, July, 1903, vol. 20, p. 328, Dr. A. Gockel, of Freiburg, in Switzerland, says:

It may perhaps be of interest if I add that I myself in the course of some measurements of the ultra violet radiation, using the actinometer of Elster and Geitel, have made the same observation, namely, the diminution of the insolation. On the best days of this past winter, 1902–3, after 11 a. m., the sky almost regularly became covered with a layer of haze that scarcely affected the brightness as observed with the eye, but changed the deep blue of the sky into a somewhat paler tint, and on many days reduced the ultra violet radiation to one-half of its normal value. This absorbing haze can not belong to the lower stratum of the atmosphere, since, in the first place, when the sun's altitude was less than 25°, the radiation was quite normal, and secondly, I have frequently observed the summit of the Bernese Alps, 4000 meters high, with a rare degree of clearness on those days on which the depression of the midday insolation was very pronounced.

The astrophysical division of the splendid observatory of the Grand Duke of Baden, located at Heidelberg, is under the direction of Prof. Max. Wolf, and is located on the summit of Königstuhl a short distance from the famous university. The astronomical section of the observatory, or the "astrometrische division," as it is more specifically called, is under the direction of Prof. W. Valentine. In the latter section, everything bearing on the measurement of the positions of the stars is elaborately observed; this includes the changes in the ground produced by earthquakes and the changes in latitude due to the movements of the earth's axis. In the astrophysical section, under Professor Wolf, the complete meteorological record is maintained; photographs of the sky are made every clear night; the transparency of the atmosphere, the radiation from the sun, the study of the planets by photography, spectroscopy, and photometry, the observations of nebulæ and fixed stars, in fact whatever bears on the nature of the celestial bodies are all carefully recorded. In the course of his annual report on these matters for the year 1902 Professor Wolf says (Vierteljahrsschrift Astronomische Gesellschaft, 1903, 38 Jahrgang, p. 117):

The most interesting meteorological event during 1902 was the unexpected splendor of the twilight phenomena, which attained nearly the same development as in the year 1884. The first purple twilight was observed by us on the 17th of June. The phenomena followed the same order as described in such a masterly manner by von Bezold. After the 17th of June, the complete succession of phenomena was observed on every clear evening until July 6; after that date only the ruby red color could be observed, but much brighter than in other years. The two purple lights and the purple counter-twilight glow were best developed on the 26th of June. On the 24th of July, there began a second feebler development of the purple light, which lasted the whole year through,

[3] See reprint at end of this article.—ED. [4] Ibid.

with alternating feebler and stronger developments. A maximum in October was especially well marked. It is remarkable that Bishop's ring could not be certainly recognized until January, 1903; it was measured around both the sun and moon, respectively.

Of course, an effort was made to bring these phenomena into connection with the outburst of volcanoes in the West Indies. Now the first violent eruption of Mount Pelée occurred on the 8th of May, 1902. It would, therefore, have required six weeks for the dust to arrive at that stratum of air above Heidelberg where the purple light originates. But other observations, namely the daily observations of insolation, seem to indicate that the dust had hovered over us somewhat earlier. The following are the pentadal averages of the observations of the radiation thermometer. [Presumably the black bulb in vacuo of the Arago-Davy actinometer.—ED.]

Pentads.	Mean of the radiation maxima.
	°C.
May 26–31	45.8
June 1–5	49.9
June 6–10	39.3
June 11–15	39.1
June 16–20	40.0
June 21–25	41.2
June 26–30	46.4

From these figures it would seem probable that the obscuration due to the dust occurred over this observatory about or before the 10th of June, which corresponds to a velocity of five weeks instead of the six weeks above given.

During the whole of the second half of the year the astronomical transparency of the atmosphere was much less than usual.

One must be very careful not to misinterpret the readings of the Arago-Davy actinometer. The correct theory of the action of this instrument was first given by Prof. William Ferrel in his memoir on the temperature of the atmosphere and earth's surface, pp. 34–48, "Professional papers of the Signal Service, No. XIII, Washington, 1884." See also Ferrel's "Recent advances;" also Prof. Winslow Upton's report on the actinometric observations made during the United States Eclipse Expedition to the Caroline Islands. According to Ferrel the insolation must not be measured by the mere reading of the maximum thermometer, but depends upon both this and the difference between the bright and black bulb, and must be computed by the formula

$$I = 4.584\rho\mu^{\theta_1}\left(\mu^{\theta-\theta_1}-1\right)\frac{1}{1-4\rho_1}$$

in which he assumes that the two conjugate thermometers have spherical bulbs. ρ_1 is the relative absorbing power of the bright bulb as compared with the black bulb, and must be determined for each instrument. θ is the temperature of the black bulb, θ_1 is the temperature of the bright bulb, μ is the constant, 1.0077, as determined by Dulong and Petit. The following table, quoted from Ferrel, illustrates the working of this formula:

Values of I for different values of θ and θ_1.

θ_1.	$\theta-\theta_1$.			
	10° C.	20° C.	30° C.	40° C.
°C.				
−10	0.339	0.705	1.099	1.525
0	0.366	0.761	1.187	1.646
+10	0.395	0.822	1.282	1.778
20	0.426	0.887	1.385	1.920
30	0.460	0.958	1.495	2.073

ED.

ORIGIN OF AMERICAN COLD WAVES.

In a letter of January 26 to Prof. R. F. Stupart, the Editor said:

I have just read an old excerpt from the Cœur d'Alene Sun. We have taken careful note of the development of these cold waves in the Klondike, and it usually takes three weeks for them to travel down to the weather stations at Edmonton, Qu'Appelle, and Havre.

I myself suppose that the cold of cold waves is due entirely to the radiation of heat from the lower strata of the atmosphere to ground and to the clear sky overhead, as explained in my article on "Atmospheric radiation and its importance in meteorology," published in the American Journal of Science in 1892, and reprinted in the American Meteorological Journal, vol. 8, p. 537. I suppose, therefore, that a cold wave may originate anywhere along the western slope of the Rocky Mountains, and its coldness when it reaches Montana would depend on the slowness with which it has moved southward, so that it may possibly be true that the very coldest temperatures come with cold waves that have taken three weeks to move from the Klondike southward. I am rather inclined to doubt whether any of our cold waves, at least those worthy the name, originate north of British America, but that they all begin with the clear air that flows over the northern part of the Rocky Mountain range.

Under date of February 9, 1904, Professor Stupart replied as follows:

I am studying the question, using the data from Dawson, Fort Good Hope, Chippewyan, Fort Churchill, York Factory, Edmonton, and Winnipeg. In a short time I shall hope to send you something further. I am almost satisfied that the Cœur d'Alene Sun is astray in supposing that it takes three weeks for cold waves to travel from the Klondike to Alberta and Havre. There is, I think, some ground for a belief that in many seasons the cold waves take about six days. This is indicated in the winters of 1901–2 and 1902–3, but it is certainly true that in some seasons waves of intense cold which are experienced in the far north never reach Alberta or even Winnipeg. This present winter, in December the coldest weather seems to have occurred simultaneously at Dawson, Edmonton, and Winnipeg. In January the greatest cold wave set in at Dawson on the 9th or 10th, and the coldest weather of the month began at Edmonton on the 15th. This is also about six days. But this present month another great cold wave set in over the Yukon on the 2d, and almost coincidently the weather turned decidedly cold at Edmonton.

I spent the winter of 1884–1885 in Hudson Strait on the barren grounds. February of that winter was there exceedingly mild for that region, while in Toronto it was the coldest month, but one, recorded in seventy years. I quite agree with you that probably none of the cold waves originate north of British America, but it appears to me that they may originate almost anywhere over the more northern portions of the continent. The cold waves which have passed across the Great Lakes and the St. Lawrence Valley this winter do not appear to have originated in the far northwest, or at least they have become much more intense as they approached Ontario and Quebec.

With regard to the cold of cold waves being entirely due to the radiation of heat from the lower strata of atmosphere to the clear sky overhead, I can not offer other explanation, but at the same time, I doubt whether it is the full explanation. In some winters great cold waves persistently form, while in other years, with barometric and cloud conditions as far as we can judge almost identical, the resulting cold waves are relatively unimportant.

I do not believe in moon or planets having any appreciable effect on the terrestrial weather. The sun alone is to be considered, and I hope there is now some ground for belief that the physicist may shortly give us information regarding solar radiations which may assist in solving some of the perplexing problems in meteorology.

DESTRUCTIVE STORMS IN KENTUCKY, FEBRUARY 7, 1904.

By H. B. HERSEY, Inspector, Weather Bureau.

Very severe destructive local storms occurred at many places in Kentucky during the early morning hours of February 7, 1904.

In several localities these storms assumed the characteristics of a tornado. Occurring between 2 and 5 o'clock in the morning, when few people were awake, accurate description of the sky and clouds are not obtainable, but an examination of the effects of these storms shows that some of them were tornadoes.

While the season and time of day were not favorable to such storms, the pressure and temperature conditions were favorable. At 7 p. m. of February 6 there was an area of very low pressure central over Illinois, with secondary disturbances in Oklahoma and Colorado. These centers must have developed

greater energy during the night of the 6th and concentrated just north of the Ohio River.

At Louisville the barograph registered the least pressure, 28.90 inches (actual), about 3:40 a. m. of the 7th. This was followed by a sudden increase, amounting to .15 inch within thirty minutes. The temperature at Louisville at 3 a. m. of the 7th was 67°, very high for the hour and season.

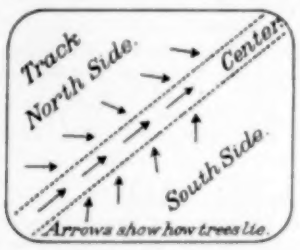
Thunderstorms, high winds, and heavy rains were general throughout the Ohio Valley during the same night.

At Cecilian, in Hardin County, two churches and several smaller buildings were destroyed and many houses unroofed or severely damaged. One of the churches, a very substantial brick building, was leveled to the ground, with the exception of a portion of the front wall, which was left standing. The rectory, standing within a few feet of the church, was uninjured. The other church was a lighter building. This was entirely demolished, even the foundation stones being moved out of place.

This occurred about 4:30 in the morning of the 7th. The destructive part of the storm lasted less than five minutes. The sky was inky black, except when lighted by vivid flashes of lightning.

Rev. J. J. Abell, of Bethlehem Academy, St. John, Hardin County, reports:

The violent storm of February 7 passed through the southeast side of Cecilian, which is 4 miles southeast of here. The exact time at Cecilian was at 4:25 a. m., central time. The rain was very heavy for about fifteen minutes. The direction of the storm's movement through Cecilia was north 51° east; the path of greatest destruction was about 3 miles long and 240 yards wide. Lightning was almost continuous. The direction in which trees fell is shown by the accompanying diagram.



In Ohio County, about 3:45 the same morning, a similar storm struck the little village of Narrows, practically wiping it out. The town consisted of about thirty residences and six business houses, and of these not one escaped severe injury and many were entirely destroyed. The path of this tornado seems to have extended from Dundee to Narrows, a distance of about 3 miles.

In many other localities in the central and northern portions of the State destructive storms occurred about the same time. Great damage was done to buildings and much property destroyed, but strange to say no lives were lost.

TORNADO AT MERIDIAN, ILL.

The following is summarized from a report, accompanied by a clipping from the Cairo Citizen, by Mr. Lewis Redding, of a tornado that struck the residence of the latter at Meridian, Ill., on February 7. The family were awakened by a clap of thunder, "the loudest I ever heard" at about 2 a. m., and the tornado struck the house a minute later with a roar like a train of cars. The building, which was two stories and a half high and very substantially built, was lifted from its brick foundations, turned around, and dropped. All the other buildings on the place, with the exception of the barn, were wrecked, and portions of them were carried more than a mile away. An oak tree 20 inches in diameter was twisted into splinters. The storm moved from southwest to northeast, over a path ten rods in width. The shape and motion of the clouds could not be observed, but the manner in which the débris was scattered indicates that the wind had the whirling motion characteristic of tornadoes. There was no loss of life, and the property loss, exclusive of damage to the house, was about $3000.

Meridian is about two miles east of Villa Ridge and 9 miles north of Cairo. The Weather Bureau office at Cairo reports a storm accompanied by extremely vivid lightning and moderate thunder. The wind reached a maximum velocity of 66 miles per hour at 2:41 a. m., and considerable damage was done.

RAIN AT FREEZING TEMPERATURES.

By E. D. EMIGH, Assistant Observer, Dodge City, Kans.

As my reports of rain and freezing temperatures at 8 p. m., January 1, and 8 a. m., February 17, have been questioned because of their apparent inconsistency, I would report in detail the following extract from the station record:

January 1, 1904.—Light misty rain, amounting to .02 of an inch, fell from 9:15 a. m., to 8:45 p. m., seventy-fifth meridian time, the maximum temperature during the entire duration of the storm being 23°, while a minimum of 20° was recorded. Though light snow accompanied the rain at intervals during the afternoon, the mist reached the ground in liquid form, and froze in solid sheets of ice on the sidewalks, sides of buildings, the ground, and whatever else it struck, indicating conclusively the existence of a stratum of warm air at no great elevation.

February 17, 1904.—In all essential particulars, this storm was identical with that of January 1. The existing temperature and its range, the character and amount of precipitation, and the prevalence of northerly wind and rising pressure were almost exactly the same. In this storm, however, no snow accompanied the rain, and it may also be of interest to note that several hours of its duration were at night.

The determination of the direction of cloud movement in these disturbances is a matter of considerable difficulty, but clearing weather about six hours after the ending of precipitation on the 17th of February disclosed a moderate velocity from the southwest at the stratus cloud level. It seems that the air currents even at comparatively low elevations have directions differing very materially from those at the earth's surface.

FORMATION OF CLOUDS OVER LAKE MICHIGAN IN WINTER.

By Rev. CHARLES H. LEE, Racine, Wis., February 14, 1904.

The influence of lakes on local climate has been frequently referred to in the MONTHLY WEATHER REVIEW.[1] The following remarks contained in a letter to Prof. Frank H. Bigelow from Rev. Charles H. Lee, of Racine, Wis., under date of February 14, 1904, throw additional light upon the subject, since this careful observer has watched the formation of clouds over the lake as observers can not do at stations farther east, because so much of the time they are enveloped in the clouds:

Has the station at Milwaukee this winter noted the frequency of cloud movements from the northeast during periods of high? Apparently these movements occur with the onset of a southwestern low, and they are almost always followed by a northeaster, and consequent rise in surface temperature. Sometimes these clouds come up against a clear sky; sometimes against a sky marked by a thin line of cirrus, which seem to move more from the west than from the northwest, surface currents being always at these times from the northwest. I have several times predicted warmer weather and northeast winds, and I don't think I have missed it once. The clouds from the northeast are clearly aqueous vapor from over the lake, and can be seen gathering on the eastern horizon and slowly moving landward. It usually happens about noon, after a clear, cold morning, with the temperature about 0° F. When the temperature is below 0°, the whole surface of the lake steams like a boiling kettle, but when the sun is well up and the temperature has risen to + 5° or + 10° the *steaming* ceases and the eastern sky is massed full of this accumulated vapor, which seems to *break off* and slowly float shoreward, sometimes almost like a small summer cumulus. It makes an excellent illustration of your remark that "masses of air at different temperatures are reluctant to lose their individuality." It is usually about twelve to eighteen hours before the northeast surface current is established. Once or twice it lasted only a short time, the wind backing again to the northwest.

Just now things are peculiar, the lake being frozen wholly over for several miles, to the utter confusion of gulls and fish ducks, which are reduced to semistarvation and come ashore in flocks to attack garbage piles and sewer openings, and pathetically hunt possible air-holes. Yes-

[1] See Monthly Weather Review, 1891, Vol. XXIX, pp. 422 and 563; 1892, Vol. XXX, p. 135.

terday a flock of fish ducks sat on the ice over what was an air-hole the day before, and consequently covered with thin, transparent ice. Whether they saw minnows and perch swimming underneath I don't know, but they were motionless for an hour or more. Sailors say the lake is frozen across to Michigan, but that idea is nonsense and is exploded by the fact that my "pillar of cloud" is over the eastern horizon just the same, which it would not be but for open water.

REMARKABLE METEORS.

By Lieut. FRANK H. SCHOFIELD, U. S. Navy.

The following report, as kindly communicated by the editor of the Pilot Chart, is dated U. S. S. *Supply*, at sea, latitude 36° 20′ north; longitude 127° 36′ west, February 28, 1904:

1. I have the honor to report that three somewhat remarkable meteors were observed from this ship at 6:10 a. m. (Greenwich mean time 3 hours 12 minutes) February 28, 1904, in latitude 35° 58′ north, longitude 128° 36′ west.

2. The meteors appeared near the horizon and below the clouds, traveling in a group from northwest by north (true) directly toward the ship. At first their angular motion was rapid and color a rather bright red. As they approached the ship they appeared to soar, passing above the clouds at an elevation of about 45°. After rising above the clouds their angular motion became less and less until it ceased, when they appeared to be moving directly away from the earth at an elevation of about 75° and in direction west-northwest (true). It was noted that the color became less pronounced as the meteors gained in angular elevation.

3. When sighted, the largest meteor was in the lead, followed by the second in size at a distance of less than twice the diameter of the larger, and then by the third in size at a similar distance from the second in size. They appeared to be traveling in echelon, and so continued as long as in sight.

4. The largest meteor had an apparent area of about six suns. It was egg-shaped, the sharper end forward. This end was jagged in outline. The after end was regular and full in outline.

5. The second and third meteors were round and showed no imperfections in shape. The second meteor was estimated to be twice the size of the sun in appearance, and the third meteor about the size of the sun.

6. When the meteors rose there was no change in relative positions; nor was there at any time any evidence of rotation or tumbling of the larger meteor.

7. I estimated the clouds to be not over one mile high.

8. The near approach of these meteors to the surface and the subsequent flight away from the surface appear to be most remarkable, especially so as their actual size could not have been great. That they did come below the clouds and soar instead of continuing their southeasterly course is also equally certain, as the angular motion ceased and the color faded as they rose. The clouds in passing between the meteors and the ship completely obscured the former. Blue sky could be seen in the intervals between the clouds.

9. The meteors were in sight over two minutes and were carefully observed by three people, whose accounts agree as to details. The officer of the deck, Acting Boatswain Frank Garvey, U. S. Navy, sighted the meteors and watched them until they disappeared. He sent a messenger to me who brought an unintelligible message. When I arrived on the bridge the meteors had been obscured for about one-half of a minute.

PRECIPITATION FOR TWENTY-NINE YEARS AT DODGE CITY, KANS.

By E. D. EMIGH, Official in Charge.

In studying the adaptability of a climate to the requirements of any particular crop, only the data for the germinating and growing season should be considered. It is not an uncommon mistake to base conclusions upon figures showing the total precipitation and mean temperature of the entire year, whereas, the applicable data probably covers a period of not over six months. For facility in this work, figures for each month and each quarter of the calendar year have been compiled.

Amounts of moisture that would not be sufficient to be of great practical value in the hot months are frequently of very great importance when received by the soil at a more favorable season. Heavy snow slowly melted, or a gradual soaking rain at a time of comparatively inactive evaporation, is more beneficial by far than the heavy downpours so common to the summer months. In this connection it is interesting to note that the large wheat yields of 1892 and 1903, in Ford County, were produced under conditions of deficient rainfall, not only for the year, but for the crop season as well. In both instances the soil was blessed with an unusually abundant supply of moisture early in the season, and was subsequently benefited by timely rainfall.

After a careful investigation of the records of this station, published herewith, and of the records of the western third of the State for sixteen years, we feel justified in making the statement that there is no foundation in fact for the assertion that the rainfall in western Kansas is increasing from year to year.

Precipitation, Dodge City, Kans.

Year.	First quarter.	Second quarter.	Third quarter.	Fourth quarter.	Annually.
	Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*
1874				0.56	
1875	0.26	3.70	6.66	0.15	10.77
1876	3.64	3.84	5.42	2.50	15.40
1877	0.99	12.26	6.38	8.26	27.89
1878	2.35	7.88	6.85	0.88	17.96
1879	1.12	5.70	8.45	0.16	15.43
1880	0.04	5.03	9.49	3.88	18.44
1881	2.28	16.97	10.55	3.75	33.55
1882	0.98	6.03	4.26	1.84	13.14
1883	2.28	12.12	9.59	4.51	28.50
1884	2.27	13.21	11.45	3.43	30.36
1885	1.74	7.48	11.31	3.18	23.71
1886	3.78	7.77	6.86	0.94	19.35
1887	0.77	10.15	3.42	1.37	15.71
1888	1.89	12.10	7.85	1.10	22.94
1889	3.41	7.09	5.02	3.65	19.17
1890	0.86	5.09	4.24	1.53	11.72
1891	4.57	12.39	11.08	4.30	32.34
1892	3.88	6.97	6.39	2.42	19.66
1893	0.36	2.11	6.88	0.77	10.12
1894	1.47	5.63	4.23	1.27	12.60
1895	4.15	7.20	7.32	1.64	20.31
1896	0.74	8.61	7.20	3.32	19.87
1897	4.08	7.01	7.57	2.92	21.58
1898	2.68	15.85	8.56	4.37	31.46
1899	0.75	13.22	8.77	5.71	28.45
1900	1.74	8.90	9.02	1.10	20.76
1901	1.41	7.83	5.06	1.76	16.06
1902	2.08	6.60	5.95	3.07	17.70
1903	3.62	6.34	2.95	2.36	15.27
Averages:					
Rainfall	2.07	8.45	7.19	2.64	20.35
Rainy days	16	25	20	14	75
Temperature	34°	64°	74°	43°	54°

A rainy day is one with 0.01 of an inch or more of precipitation.

Total amount in the wettest year, 33.35 inches in 1881.

Total amount in the driest year, 10.12 inches in 1893.

Total in the wettest first quarter year, 4.57 inches in 1891.

Total amount in the driest first quarter, 0.04 inch in 1880.

Total in the wettest second quarter year, 16.97 inches in 1881.

Total in the driest second quarter year, 2.11 inches in 1893.

Total in the wettest third quarter year, 11.45 inches in 1884.

Total in the driest third quarter year, 2.95 inches in 1903.

Total in the wettest fourth quarter year, 8.26 inches in 1877.

Total in the driest fourth quarter year, 0.15 inch in 1875.

Wettest month was May, 1881, with 12.82 inches.

Driest month was December, 1889, with none.

Greatest average monthly number of rainy days, 10 in June.

Least average monthly number of rainy days, 4 in January and November.

Temperature: Annual mean, 54°; warmest month is July, with an average of 78°; coldest month is January, with an average of 28°.

Though the successive periods from the sowing to the maturing of winter wheat overlap to a certain extent, in this region they conform quite closely to the calendar quarters, and it is mainly on this account that this division of the year was selected for the above table. The fact that the growing season for our principal spring crops, oats and barley, ends late in June or early in July also makes this method more desirable for the study of climate and crops than the seasonal division of the so-called meteorological year.

To summarize in a brief and general way, July, August, and

September are months of harvesting and thrashing, followed by the preparation of the soil for fall-wheat sowing and the beginning of sowing. October is devoted to the completion of fall work in the field, and November and December to germination, a considerable growth sometimes being obtained ere the end of the quarter, for use as winter pasture. Upon the precipitation during the first quarter of the calendar year, and especially in February or March, depends to a great extent the prospects of the wheat crop; this might, perhaps, be termed the rooting season, for growth to the jointing stage is not permitted for fear of destruction by frost; spring-grain sowing is well advanced by the end of March. The wettest quarter of the year is April, May, and June, which constitute the growing season for all small grains, and the end of June usually witnesses the maturity of winter wheat and the close approach of the end of the oat and barley season.

Since irrigation water is not available in this section, and since no dependence can be placed upon the weather in July and August, which months are often dry and always hot in the daytime, the farmer relies principally upon produce that develops beyond danger early in the summer. It is necessary, however, to have fodder and hay with which to supplement buffalo grass pasturage in case of severe storms or scarcity of grass, and it is, therefore, customary to plant considerable corn, cane, and Kafir corn. Corn is planted, not with the expectation of securing a grain crop, though the profits from an occasional favorable season are perfectly acceptable, but for the more certain returns from its fodder. The most important hay crop in this region is alfalfa, to which all available bottom land is sowed, and from which three or four crops of hay are secured each season.

These remarks apply to southwestern Kansas, where the climate is different in many respects from that in other portions of the State. The much greater rainfall in the middle and eastern sections of the State permits the raising of immense corn crops in the most favorable seasons, and good crops in average seasons, as also numerous other agricultural products that can not be successfully grown in the western portion of the State.

DETAILED CLOUD OBSERVATIONS IN COLORADO.[1]

By J. B. WILLSEA, Voluntary Observer, Fruita, Mesa County, Colo., dated February 10, 1904.

For a dozen years past almost all the relaxation I have enjoyed has been in studying the clouds, but without the aid of teachers, books, or instruments. This is my only excuse for writing you. One of your assistants may find a kernel of grain in the chaff I present and be able to use it in his own special line. I never saw any of the facts mentioned below in print, nor heard them from others.

The top of a fleecy cloud leans in the direction it is traveling, because the top travels faster than the bottom, it being less affected by the friction of the air against the earth's surface.

The sun's rays sometimes seen in the east at about sunset, converging at a point diametrically opposite the sun, are parallel, and are lights and shadows of clouds in the whole sky and of mountain peaks and ridges, in this locality, projected through the atmosphere to its outermost visible limits, but the rarity of the upper air and its freedom from color prevent apparent focusing of the rays in the east.

The motion of a cloud in a vertical direction is sometimes quite rapid, for I have watched a fleecy cloud rise from the hillside and within an hour become a high cirro-cumulus.

When a rain cloud is rapidly rising, the under side is frequently covered with small, curling masses of vapor, especially in showery weather, resembling in shape the swirls or boiling of the water in the wake of a steamer. Of course this indicates a rising barometer, but I have no means of determining whether a cloud is approaching the earth or not, save by its increasing density.

I have never seen a cumulus cloud increase in size at the bottom; the increase was always at the top. Cumulus clouds sometimes rise to an immense height, cirro-cumulus appearing far below them.

The reflection of a cloud in a still lake appears larger than the original cloud.

In looking at a colored sunset, if the head is inclined so far to one side that the eyes are upside down, the colors appear much more brilliant.

The appearance of the clouds at a distance, where by reason of the curvature of the earth they touch the horizon, proves the sphericity of the globe. Otherwise the clouds would appear smaller and smaller until they became telescopic; but they do not.

The sphericity of the earth is shown by the sunset tints lingering much longer in the northern part of the horizon in the summer and in the southern part of the horizon in the winter than would be the case if the shape of the earth were not spherical. We can see the longer day to the north of us at sunset in summer and the same to the south of us in winter. I do not refer to the clouds, but to the tints of the clear sky, visible to a great distance.

At morning and at night at certain seasons of the year, there is seen apparently a portion of a cloud hanging down from the main cloud something like a beard, and resembling rain, but not having the even, clear, direct lines of descending rain seen at a distance. It puzzled me for years, but on seeing the phenomenon with tall cliffs as a background, I saw that the precipitation left the cloud as snow, but was melted to rain long before it touched the earth, perhaps even evaporating before reaching the ground. This occurs when much of the sky is clear and with isolated clouds mostly, where the clear sky furnishes a good background for observation.

I find that the thermometer shelter used by the cotton-belt observers has one fault; the rain fills the horizontal crack at the top of the door, and at night time the door freezes fast to the casing, so that damage is done in opening it. I have had no further trouble since I bevelled off the top of the door a little, thus allowing the rain to flow away.

MIDWINTER WEATHER CONDITIONS IN WESTERN ONTARIO.

By A. G. SEYFERT, Stratford, Ontario, dated January 26, 1904.

Not within the memory of the oldest inhabitant has western Ontario experienced such an unprecedentedly severe winter as this. Instead of the usual autumn rainfall, fine weather prevailed up to the middle of November, when it turned cold and commenced to snow, and has continued almost incessantly to the present time. Four feet of snow on the level and drifts in many places four times that depth result. Country roads are blockaded, and communication almost entirely cut off. Railroads are in but little better condition. The main lines are kept open, but many of the branches are completely snowed under and abandoned for the present. Every effort is being put forth in fighting the elements to keep the roads open, but never did such conditions prevail since railroads were first built in this province. The high winds, the intense cold, and the enormous quantity of snow are more than human agencies can overcome. The local papers are full of details of all sorts of accidents and fatalities attributable to the weather conditions. Roofs breaking down from the weight of the snow, people frozen to death within sight of their homes, freight trains loaded with live stock in snow drifts until the strongest

[1] Although many of these observations are not new to meteorology, yet the whole article is in the right direction, and we can only hope that Mr. Willsea may continue to observe and elucidate the important cloud phenomena.—ED.

animals only survived; is the tale that could be prolonged indefinitely.

During the two and a half months of this remorseless climate the mercury has been but once or twice above the freezing point, and for days many degrees below zero all day. One of the most serious features of this condition of affairs is the water famine with which most of the farmers have to contend. The rainfall had been below the average when the winter set in, and since then none has fallen, and the water supply of most of the farmers is exhausted, causing great inconvenience and in many cases much suffering.

February is usually the worst winter month in this latitude, and if this is the case this year untold privations will have to be endured before the end is in sight.

A WEST INDIAN STORM.

By Mr. JOHN S. QUIN.

Mr. John S. Quin, Editor of the Avis, Christiansted, St. Croix, sends the following relative to a disturbance of moderate intensity, No. VIII on Chart II of the MONTHLY WEATHER REVIEW for October, 1903. On that chart the track is given from Cuba to New Foundland. With regard to its previous history, Mr. Quin says:

There was a normal condition of the atmosphere up to Tuesday morning, October 20, for cirrus clouds were seen coming from about northwest. But by noon on Wednesday, October 21, an important change had taken place, for through the spaces among the lower and middle clouds, which were then accumulating in heavy masses, a layer of high clouds (cirro-stratus) could be seen moving slowly up from about south. This motion of the high clouds made it highly probable that a cyclone center had been formed, or was forming, toward the south. And the evidence of the high clouds was strengthened by that of the lowest clouds, which were moving rather fast from east-southeast, and thus, when taken with the other signs, indicated a cyclone center to south-southwest, which was probably its actual position at that time. The subsequent course of the weather harmonized with these conclusions, for by noon on Thursday the wind had gone round to south, and it was coming from the same quarter on Friday morning, with much cirro-stratus coming from the west. By noon on the same day the wind had gone round to south-southwest, and in the afternoon was even a little farther round toward southwest. As darkness approached, however, it was very interesting to notice how a layer of middle clouds (alto-stratus), which was coming slowly from southwest by west, gradually became still slower till hardly any motion could be seen in it. The night settled down in a calm, and the early morning (Saturday) showed the lower clouds moving from south-southeast. Hence, we concluded that the cyclone had left us and that the wind was falling back to its normal direction. It continued to fall back, till, on Sunday morning, it was blowing very gently from east, or, to speak more accurately, the clouds were moving from the east while the wind (surface wind) had gone round so far as to blow from east-northeast. The evidence of the barometer readings had in the meantime kept pace with the evidence of the wind changes, as will be seen from the table below.

Now comes the very interesting question: Did this depression originate in the Caribbean or did it come from the Atlantic? Considering the apparent absence of evidence from the island reports, we were at first inclined to the former opinion, but after arranging the evidence so as to take a bird's eye view of it, we are obliged to come to the conclusion that the depression passed in from the Atlantic, but in so mild a form as at first to have escaped notice. We are inclined to believe, also, that the movement increased in force as it went on, and that it made a special advance in strength on Wednesday. To this point, however, we will return later. We would now ask the attention of the reader who has followed us thus far to the table below, where we give the barometer readings and wind directions for the three islands, Santa Cruz, Antigua, and Barbados. Of these three islands, Barbados is farthest to windward and Santa Cruz farthest to leeward, while Antigua lies between. A cyclone center following the usual direction would have to travel nearly 300 miles in passing from its nearest point in regard to Barbados, to its nearest point in regard to Antigua, and would then have to travel a little over 200 miles more before making its nearest point to Santa Cruz. Now, if we examine the figures given in the table, we shall see that the lowest morning reading for each place (*the figures in italics*) show a progressive movement from east to west. For Barbados it was on *Monday*, for Antigua on *Tuesday*, for Santa Cruz on *Wednesday*. The table seems then to prove that the *barometrical depression* was not formed in the Caribbean, but over the Atlantic, and that it moved from the latter into the former.

But is there any evidence of a cyclonic movement? If we use the word cyclone as meaning hurricane, certainly it is obvious that there was nothing of the sort; but if we use it in its proper sense, as meaning a rotary movement of the air, then there is some evidence for it. At Barbados we notice that the wind on Saturday morning (17th) was east-northeast, but by Monday morning, when the barometer had reached its lowest point, it was east-southeast, and the following morning it was from southeast. This was a true cyclonic behavior of the atmosphere, and we can now see that the depression passed on the south side of Barbados. The force, however, must have been extremely weak, for we see no more of its effects among the islands to windward till we come to the south wind in Antigua on Thursday and Friday. That wind was doubtless a portion of the cyclonic movement, the center being then far away to the west. In Santa Cruz the cyclonic movement was well marked during the latter part of the center's passage, say Wednesday to Friday, when it was passing south of us, and afterwards was moving off to the northwest.

The reader is now referred to the table, which shows the wind directions as well as the morning readings of the barometer. Where two directions are given for one day, the upper is from the morning report and the lower from the afternoon report.

Morning readings.

Date.	Santa Cruz, 8 o'clock.		Antigua, 9 o'clock.		Barbados, 10 o'clock.	
	Pressure.	Wind direction.	Pressure.	Wind direction.	Pressure.	Wind direction.
Saturday, October 17	30.04	ese.	30.04	e., ne.	30.13	ene., e.
Sunday, October 18	30.04	e. by n.	.....	.....	.....	.....
Monday, October 19	29.98	e.	29.94	e.	*30.05*	ese., s.
Tuesday, October 20	29.96	e.	*29.92*	e.	30.06	se., ese.
Wednesday, October 21	*29.94*	ese.	29.94	e.	30.08	se.
Thursday, October 22	29.97	ese., s.	29.97	s., se.	30.12	ese., s.
Friday, October 23	30.00	s., ssw.	30.02	s., e.	30.17	se.
Saturday October 24	30.03	sse.	30.03	e.	30.16	se., e.

Lastly, we return to the question: Did the force of the movement increase on Wednesday, the 21st? It was probably gathering strength all the time of its passage, and the fact that the outward flow of the higher air from the center was not detected here till Wednesday may be explained, at least in part, by the fact that its center had not till then arrived at its nearest approach to us. On the other hand, there is the curious fact that on Wednesday morning the barometer here fell from 29.94 at 8 a. m. to 29.87 at noon, an unusual fall, since under ordinary circumstances the reading at noon is about the same as at 8 a. m. A still more interesting fact is that at Antigua and Barbados the afternoon readings on Wednesday showed two-hundredths and seven-hundredths, respectively, below the afternoon readings of the previous day, notwithstanding the fact that at both islands the barometer had started to rise. To make this matter as clear as possible, we give a table of the afternoon readings of the barometer at Antigua and Barbados.

Afternoon readings (4 o'clock).

Date.	Antigua.	Barbados.
Friday, October 16	29.98	30.04
Saturday, October 17	*	30.04
Monday, October 19	29.83	29.93
Tuesday, October 20	29.85	29.97
Wednesday, October 21	*29.83*	*29.92*
Thursday, October 22	29.89	30.05
Friday, October 23	29.98	30.10
Saturday, October 24	*	30.09

* Not given.

Perhaps, after all, it would be a mistake to attach much importance to this small fall; still it is well worth notice.

If, then, we wish to make a picture for ourselves of the weather conditions in this part of the world last week, we must first think of a wide area of sea out in the Atlantic, but near to our islands, over which the air was rather lighter than over the surrounding parts. This wide area gradually advances on us during the first days of the week and fills up the eastern part of the Caribbean Sea. By Wednesday we get evidence that a cyclonic center has been formed, and we see from the motions of the wind that this center subsequently advances toward the northwest. On Wednesday it is nearest to us, but by Saturday morning it has withdrawn itself, and the usual fine weather returns. Whether this center, which has thus passed us and traveled onward, has been very stormy or not, can not yet be told, perhaps never will be, for unless its force has grown so much as to assume a destructive character no one will notice it. For us in St. Croix the movement has been one of immense value, bringing us, in the form of heavy and long expected rains, just what was wanted to insure for us in regard to our staple industry a fairly good position in the coming year.

CLIMATOLOGICAL TABLES FOR MERZIFOUN, TURKEY.

By Prof. J. J. MANISSADJIAN, dated Anatolia College, Merzifoun, February 26, 1904.

In continuation of tables published in the MONTHLY WEATHER REVIEW for January, 1903, p. 25, I take pleasure in presenting the following summary of monthly and annual values observed by myself at the observatory of Anatolia College, Merzifoun, latitude 40° 51′ north; longitude 35° 31′ east, altitude 751 meters, or 2646 feet.

Meteorological records at Anatolia College, Merzifoun, Asia Minor.

1903.	Air pressure (in millimeters).					Air temperature (in degrees centigrade).									
	Average.	Maximum.	Date.	Minimum.	Date.	7 a. m.	1:45 p. m.	9 p. m.	Average.*	Average maxima.	Average minima.	Average daily range.	Absolute maximum.	Date.	Absolute minimum.	Date.
January	694.97	699.3	25	687.7	15	— 3.6	6.5	2.8	2.38	1.47	— 3.93	5.40	8.5	14	—13.5	26
February	695.5	703.5	26	686.2	16	— 5.95	2.89	0.96	— 1.14	3.9	— 3.4	7.3	10	24	—10.5	20
March	693	699.2	28	685	7	1.70	8.41	3.66	4.3	9.47	0.32	9.15	19.5	31	— 3.5	17
April	688.5	694.7	4	684.7	7	10.25	16.4	10.45	11.8	18.18	6.25	11.93	24	19	1.5	4
May	690.9	695.8	15	686.5	25	14.93	18.9	13.1	15	20.9	9.34	11.56	30	14	5.5	19
June	688.7	692.9	4	682.4	23	18.25	21.4	15.5	17.6	23.5	12.1	11.4	28	28	9.5	7
July	690.1	694	15	685.3	22	19.3	22.8	17.3	19.1	24.30	13.42	10.88	30	9	9	6
August	690.3	695	6	682.8	18	17.6	22.5	16.8	18.4	23.5	13.5	10	30.5	18	9.5	26
September	693.8	698.1	5	688.5	11	13.1	18.4	12.8	14.3	19.2	8.9	10.3	28	16	2.5	28
October	692.5	697.2	15	685	11	8.92	15.9	11.5	11.9	16.6	6.9	9.7	23	8	1	23
November	693.9	699.7	2	684.4	23	2.9	8.15	4.8	5.2	8.6	2.2	6.4	14	22	— 4.5	27
December	693.4	700.3	22	685.5	9	2	6	3.1	3.5	6.5	1.3	5.2	11.5	11	— 3	5
Annual	693.8	697.5	.....	685.5	.....	8.28	14.02	9.4	10.3	14.68	5.57	9.11	30.5	.....	—13.5	.....

1903.	Cloudiness, 0–10.						Precipitation.					Wind, number of observations with—								
	7 a. m.	1:45 p. m.	9 p. m.	Average.	Clear days (less than 2).	Cloudy days (more than 8).	Total.	Maximum.	Date.	Days with 1 mm.	Days with more than 2 mm.	N.	NE.	E.	SE.	S.	SW.	W.	NW.	Calm.
January	6.8	6.7	5.4	6.3	8	15	20.2	5	18	2	5	1	40	8	1	3	3	3	5	29
February	4.8	5.2	4.1	4.9	8	7	7.9	2.2	23	4	1	3	35	4	0	2	7	4	6	23
March	4.7	5.4	3.8	4.6	11	8	35.2	13	12	5	3	2	40	3	5	0	8	0	1	34
April	4.1	5.4	4.3	4.6	8	4	29.7	8.7	26	4	5	3	21	2	8	2	13	4	2	35
May	4	6.2	5.3	5.2	5	9	87.1	19.8	6	4	8	4	29	1	1	0	9	0	4	45
June	4.3	5.5	4.6	4.8	6	5	95.1	24.4	14	6	10	3	31	3	2	0	14	0	1	36
July	3.9	3.8	1.9	3.2	14	3	25.2	6	6	1	5	22	32	4	0	0	2	1	0	32
August	4.4	3.8	2.6	3.6	12	3	73.3	25.6	6	1	5	23	21	1	0	0	1	1	0	46
September	3.6	2.1	2.8	2.8	15	1	10.7	10.7	11	0	1	13	29	0	0	1	0	0	1	46
October	3.4	3.6	3	3.3	17	3	33.7	20	31	1	3	15	4	0	0	0	2	0	0	72
November	6.6	6.7	5.4	6.2	4	11	38.8	14.8	14	1	5	13	2	0	0	0	0	0	0	75
December	8.1	9.2	7.5	8.2	1	29	25.1	7	31	3	4	2	0	0	1	0	0	0	1	89
Annual	4.9	5.3	4.2	4.8	109	80	482.0	.....	.....	32	54	104	284	26	18	8	59	13	21	562

NOTE.—The decimals are printed as in the original manuscript. Unfortunately, the total number of rainy days is not given. *1/3 (7 a. m. + 1.45 p. m. + 9 p. m.).

REMARKS ON BIGELOW'S STUDIES ON THE CIRCULATION OF THE ATMOSPHERE.

By Prof. A. WOEIKOF, dated St. Petersburg, Russia, March 1, 1904.

The best means to detect an influence of a change of solar radiation on the temperature of the atmosphere would be the difference of pressure between tropical heights and the lowlands at their base, as has been shown by Hann. The pressure differences would depend not only on the temperature of the whole air stratum between the pairs of stations, but also on the quantity of vapor, for as the Tropics have a great percentage of water surface a larger evaporation would result from a greater quantity of solar heat, and the effect on the temperature of the lower stratum would be marked in some cases by increased cloud and rain. Unfortunately there are few mountain or even plateau stations of the Tropics with long records. India and Ceylon would alone be available, but in that region there are stations covering the years 1873–1900 which Professor Bigelow uses. For a shorter period nearer to our time the stations in Peru and Hawaii would be available. As the tropical high stations are few and their importance is great, it would be worth while to make all the calculations necessary to give a true mean; the reduction of different hours of observation is facilitated by the very great steadiness of the daily variations of pressure in the Tropics, so that the reduction factor from hourly observations in the lowlands could be used, taking into account the diminution of pressure with altitude. I hope these remarks will not be taken as a disparagement of the excellent work of Professor Bigelow, but simply as a suggestion for a future extension.

THE VERTICAL COMPONENT OF THE WIND.

By Rev. MARC DECHEVRENS, S. J., Director of the Observatory of St. Louis, island of Jersey, England, dated March 1, 1904.

In the MONTHLY WEATHER REVIEW for November, 1903, page 536, there is an interesting note in which the Editor speaks of the vertical component of the movements of the atmosphere. It concludes with the following remarks:

It is very desirable that we should have both demonstrations and measurements of the rate of ascent and descent of currents of air. * * * Any contribution to the subject of the vertical component of atmospheric motions will be welcome to the meteorologist.

Previously, in the Editor's "Treatise on meteorological apparatus and methods," in 1887, he described an inclinometer of my invention, intended to measure the angle of the wind with the horizon, but said nothing of the anemometer with which, in 1887, I replaced this very defective vane. This anemometer fulfils the wish which he expressed to see an anemometer of rotation substituted for the vane.

I put it in operation at the Observatory of Zi-Ka-Wei, China, in 1896 and 1897. After my return to Europe I installed it in 1894 at Jersey, under conditions according well with those which the Editor demanded, in 1887, to ensure observations of real utility:

> Only in a level country or at sea, with a vane (or better an anemometer of rotation) established upon a very high tower, can we feel assured that the results of vertical measurements will be of meteorological importance, and that general currents, vertical or inclined, are really the subject of observation.

Jersey is a rather small, level island at the mouth of the English Channel, and the steel tower, of which I send a photograph, fig. 1, intended for the exposure of the anemometers, was erected on a hill of 55 meters, near the shore; it is, itself, 50 meters high, and the anemometer rises above it 6 meters, so that the total elevation of the anemometer is 111 meters.

Besides the picture of the tower I send also one of the Dechevrens universal anemometer, fig. 2. I had conceived the idea of it in China, and succeeded in having it constructed by the firm of Richard, at Paris. It analyzes the movement of the air in the same manner that a complete magnetograph analyzes the magnetic condition of the earth; it measures at the same time the direction of the wind and the two components, horizontal and vertical, of its velocity. In order to get the horizontal component I have substituted, for the hemispherical cups of Robinson, straight semicylinders, which you will easily distinguish in the

picture in the anemometer on the right; it is evident that this anemometer can not feel any effect from the vertical component of the wind. On the other hand, my inclined-blade anemometer, on the left, can not be influenced by the horizontal component, and by means of the mechanism inclosed in the box below, separate electric currents register, without any confusion, both the ascending and descending wind currents, respectively. The direction of the wind, also, is given electrically by the revolution of the two parallel vertical windmill wheels, which are below the horizontal bar carrying the anemometers. These two wind wheels have another object, viz., in revolving with the wind to turn also the horizontal bar with its two anemometers. Thus, the latter always face the wind, and one of them can never screen the wind from the other. This is of great importance in the use of rotary anemometers, and I am persuaded that in a great number of observatories, and particularly at the Eiffel Tower in Paris, the observations of wind velocity obtained with different forms of anemometer are made erroneous by the proximity of other apparatus erected in nearly the same horizontal plane. At Jersey the universal anemometer is alone on the axis of the tower, and its two windmill wheels are always under the same conditions with regard to the direction of the wind.

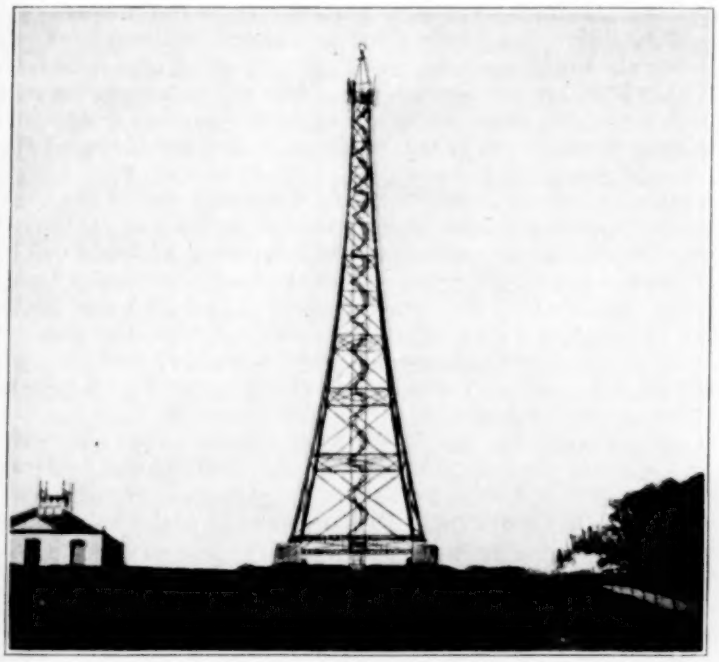


FIG. 1.—Steel tower of the St. Louis Observatory, island of Jersey; 50 meters in height; the anemometer at the summit is 111 meters above sea level.

The observations commenced in the course of the year 1894. The first eight years now form the subject of detailed studies which will be published shortly.

In the meantime, I believe I may do you a service by communicating the general results of two years which I have studied especially with regard to the *descending* component. These results do not differ sensibly from those of the eight years together.

The diurnal variation of the horizontal component of wind velocity at 111 meters above the sea level at Jersey is feeble compared to what it is near the ground and on the Continent. The ratio of the maximum to the minimum is only 1.06.[1] The variation is intermediate between that of the plains and that of the mountains; in the former we have the maximum at noon, in the latter a freshening of the wind in the middle of the night.

[1] That is 25.55/24.13.

Average components of the hourly velocity of the wind at 111 meters altitude on the island of Jersey.

Hours.	October, 1901, to September, 1903.				
	Horizontal component, H.	Vertical component.		Ratios.	
		Ascending, A.	Descending, D.	$\frac{A-D}{H}$	$\frac{D}{A}$
	Kilometers.	*Meters.*	*Meters.*		
Midnight–1 a. m	25.00	2779.2	35.1	0.1098	0.0126
1 a. m.–2 a. m.	24.80	2753.6	34.3	0.1096	0.0125
2 a. m.–3 a. m	24.72	2738.1	34.2	0.1094	0.0125
3 a. m.–4 a. m	24.77	2720.4	32.8	0.1085	0.0121
4 a. m.–5 a. m	24.43	2708.9	34.2	0.1095	0.0126
5 a. m.–6 a. m	24.32	2708.0	37.5	0.1098	0.0138
6 a. m.–7 a. m	24.13	2724.7	48.2	0.1109	0.0177
7 a. m.–8 a. m	24.35	2777.6	63.2	0.1115	0.0227
8 a. m.–9 a. m	24.58	2849.9	82.3	0.1126	0.0288
9 a. m.–10 a. m	24.92	2934.5	101.0	0.1137	0.0344
10 a. m.–11 a. m	25.28	3014.3	117.0	0.1146	0.0388
11 a. m.–Noon	25.46	3075.0	127.5	0.1158	0.0414
Noon–1 p. m	25.55	3113.8	130.8	0.1168	0.0420
1 p. m.–2 p. m	25.49	3119.9	126.3	0.1174	0.0405
2 p. m.–3 p. m	25.40	3097.9	114.7	0.1174	0.0370
3 p. m.–4 p. m	25.26	3039.0	98.5	0.1164	0.0324
4 p. m.–5 p. m	25.09	2965.7	80.8	0.1150	0.0272
5 p. m.–6 p. m	24.99	2880.3	64.0	0.1127	0.0222
6 p. m.–7 p. m	25.00	2822.8	51.3	0.1109	0.0182
7 p. m.–8 p. m	25.07	2783.3	43.8	0.1093	0.0157
8 p. m.–9 p. m	25.17	2779.0	39.5	0.1088	0.0142
9 p. m.–10 p. m	25.26	2781.3	37.8	0.1086	0.0136
10 p. m.–11 p. m	25.34	2791.1	36.4	0.1087	0.0130
11 p. m.–Midnight	25.20	2787.3	36.1	0.1092	0.0130
Mean	24.98	2865.0	67.0	0.1120	0.0234

The total vertical component is far from being negligible, and its variation is very regular; it is manifestly dependent upon the diurnal heating of the lower strata of the air, since it reaches a maximum of intensity toward 1 o'clock in the afternoon.

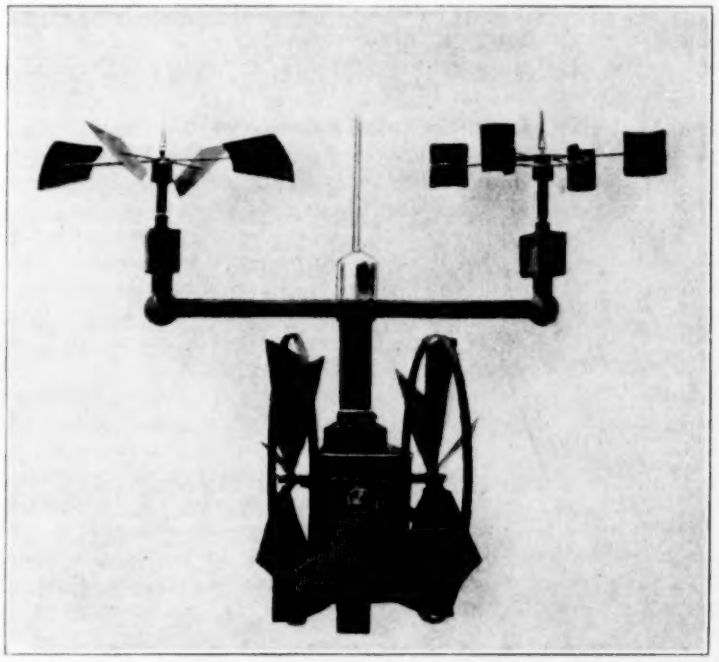


FIG. 2.—The universal anemometer of Dechevrens, which registers electrically the direction of the wind, the horizontal component of the wind velocity; the positive and negative vertical components separately.

But what is most remarkable and probably most unexpected is the variation of the descending component; the annual resultant is insignificant, but the behavior of the hourly variation is singular and will merit special attention in the general study which we have undertaken. The maximum of descending velocity occurs at noon, at the same time as the maximum of ascending velocity, and the ratio of this maximum to the

minimum, which occurs at 4 a. m., is almost exactly 4. I will confine myself to pointing out the fact; I had previously observed the same thing in China.

The Dechevrens clino-anemometer, or inclined-blade anemometer, measuring the vertical currents, has been adopted in some observatories; it was even, in 1889, installed at the top of the Eiffel Tower, but under such bad conditions that the recorded observations could not be utilized. On account of the feebleness of the vertical component, which generally causes the wind to depart but little from a horizontal plane, any obstruction that modifies the regular action of the wind on the two sides of the anemometer produces errors which quickly attract the notice of the observer. In the other forms of anemometers, having great velocity of rotation, these errors, while probably greater, are less apparent; whence it happens that they have hitherto been neglected, though improperly so. It is this circumstance which led me to adopt the special arrangement of the Dechevrens universal anemometer. The only one in existence is at Jersey, because I have not made it sufficiently well known; but I wished first to have a certain number of years of observation to study and publish. This I hope to be able to do in the course of the present year, but meanwhile I wish to call the attention of meteorologists to an instrument destined to render service by the originality and genuine value of the observations which it will furnish.

THE IMPORTANCE OF A KNOWLEDGE OF VERTICAL WIND COMPONENTS.

By watching the motions of dust and light objects blown along by the wind at the earth's surface, we shall find that however strong or light the wind may be and however smooth or rough the surface of the ground, yet the dust while carried along horizontally is always blown upward by the wind; afterwards, in sheltered places, it settles by its own weight down to the ground. The gusts of wind are thus seen to have a strong upward component, and are followed for a few moments by a steady horizontal motion. After that comes a gentler wind that may have a downward component, but this is usually too gentle to be noticed, and very delicate apparatus would be needed to measure it. It is only in the rear of large obstacles that we sometimes find heavy downward gusts. Undoubtedly the volumes of the ascending and descending air must be the same, and if we could measure the vertical components at some point high above the earth's surface we should undoubtedly be able to prove this equality, but at any point near the earth's surface we can not possibly do so, and this because of two reasons. The earth's surface is a rigid lower boundary for the atmosphere; whatever air strikes against it must thereby have its direction and velocity changed, and this mechanical influence of the boundary must extend to a considerable distance upward. The rapid descent of a stream of air toward the ground begins to be appreciably checked before it reaches the latter, and is then at once deflected into a horizontal movement. This movement may be much more rapid than the vertical descent, because the latter produces a special horizontal gradient of pressure forcing the air outward while the rest of the descending air is steadily pressing downward at the center. This is the origin of the violent upward gust in the front of every advancing and rolling mass of air. The front of every cold wave, of every thunderstorm gust, of every dusty gust in the streets of a city presents these upward gusts in the front of an advancing mass of air, which is in general pushed onward by a mass that is descending slowly to the ground or flowing toward the Tropics. Now, all gusts, as has been shown by Professor Marvin, are sources of insidious errors in the records of any whirling anemometer whose arms have a large moment of inertia; these invariably record too large a movement. The ordinary gusts of wind peculiar to the climate of Washington City have an influence that has been determined by Professor Marvin by the use of special anemometers whose moments of inertia are exceeding small, an influence that amounts to a considerable per cent of the recorded velocity of the wind. (See MONTHLY WEATHER REVIEW, February, 1900, p. 58, or Annual Report of the Chief Signal Officer, 1890.) This influence varies with the strength and duration of the gusts, and the correction for it should be determined for each locality, as it may depend very much on the building and on the method of mounting the anemometer. Marvin's small paper-cup anemometer was afterwards loaned to Professor Langley and used in his determinations of the gustiness of the wind.

Independent of all questions as to the method of construction and instrumental corrections of the Dechevrens or any other form of anemometer intended to measure vertical components, the fact that the descending motions are usually so feeble as compared with the ascending makes it evident that the above records obtained by Dechevrens on the island of Jersey and those obtained by others located anywhere near the ground are not giving us the desired relation between the ascending and descending motions of the free air. At Jersey the descending component is at midday only 4 per cent and at night-time about 1 per cent of the ascending. In Washington or other interior stations the descending velocities at night-time would show a very much higher average ratio, since the horizontal and ascending velocities frequently become inappreciable, while descending gusts still occur. In the case of foehn or chinook winds only the descending gusts are violent.

If the Dechevrens anemometer had no moment of inertia and could record the lightest winds and the heaviest gusts with the same accuracy, then the relations between his ascending, descending, and horizontal components would be valuable numerical expressions of the lower boundary conditions that must be introduced into the solution of the differential equations that occur in hydrodynamics. Accurate observations of this kind are needed for many localities, and the special conditions surrounding the island of Jersey makes that one of the most interesting spots. But we also need measurements of the three components at much higher elevations and in much freer air than is found so near the earth's surface. The observations of the altitude of a kite, the strain on its wire, the special curves in the sag of the wire, and the alternate rising and falling of the kite itself have long been recognized in a general popular way as revealing the presence of ascending and descending currents in the free air. In fact, the continuous records of tensions and altitudes and of the sway to the right and left, are sufficient to show that the oscillations of the upper winds on either side of a mean position are about equal, and that there is no such general discrepancy between ascending and descending currents, as is shown by Dechevrens in the table for the island of Jersey.

Langsdorf quotes a rule adopted by millwrights as the result of the experience of centuries; in accordance with it the plane of rotation of the windmill sails is inclined to the vertical at an angle of 15°. It is popularly said that the dangerous gusts blow downward, and that the plane of rotation must be tipped over so as to be normal to the gust, but it is likely that the play of the wind around the mill is an equally important factor. In great storms the masses of heavy air descend with a boom like that of rolling surf; so also they do in the lee of an obstacle shaped like Table Mountain at Cape Town, but these are special cases.—*C. Abbe.*

NOTE ON THE DECHEVRENS UNIVERSAL ANEMOMETER.

In 1894 the Weather Bureau installed at Washington one of the Dechevrens vertical movement anemometers, as made by Richard. The anemometer appears to be of practically the same construction as that shown in fig. 2. The mill for measuring vertical movement was the only part installed, and this was placed at the tiptop of a tall slender support rising

about 40 feet above the floor of the roof platform on the top of the Weather Bureau building. Even under these conditions of exposure the results were entirely unsatisfactory from a meteorological point of view, as the record showed a decided upward movement of the air, especially when the horizontal movement was considerable and from the north and west. This result was due altogether to the upward flow of the wind in striking and passing *over* the Weather Bureau building.

It was not considered feasible to provide a better exposure on a more lofty support, and after several months the anemometer was removed.

It is highly gratifying to see that the question of exposure has been so carefully considered by Rev. Marc Dechevrens, and the only doubt in my mind is whether the anemometer on the tower is elevated sufficiently above the top platform of the tower to be entirely free of eddies and disturbances caused by its proximity. The meagre knowledge of these conditions afforded by an examination of the photographic illustrations of the tower does not enable us to form satisfactory conclusions. A proper exposure of the anemometer is, however, only one of the several serious difficulties connected with the problem of measuring the vertical motion of the air.

A similar difficulty is found in the installation of the anemometer, so that it shall be absolutely neutral in a strictly horizontal wind. It is obvious that if the axis of the anemometer is slightly inclined from the vertical, then a wind moving horizontally will have a small component of motion parallel to the axis of the mill, and will presumably cause it to rotate. We have, therefore, in this defect of installation, a source of error which it seems to the writer it is very difficult to avoid. To be properly exposed, the instrument must be on the summit of a relatively slender support. To make the axis strictly vertical under these conditions is by no means an easy matter. We apprehend that the flexure or yielding of the support under wind pressure, especially with great horizontal motion, may not be negligible.

In the case of the Dechevrens universal anemometer, it is not sufficient to secure perfect verticality for the axis of the vertical component mill only. The axis of the apparatus which orients both anemometers must also be made strictly vertical, and furthermore must possess such an adequate degree of rigidity that flexures and temporary displacements from the vertical are not possible.

Even supposing, however, that a sufficient approximation to verticality has been attained and maintained, there is still another source of instrumental error that must be corrected numerically or eliminated mechanically before a true interpretation of the records is possible. This has reference to the symmetry of the four vanes and arms constituting the vertical movement mill. It is easy to see that if the complex system of pressures acting on this mill when it is subjected to horizontal wind are not in perfect equilibrium, a continuous or at least partial rotation will be set up, and will be attributed to a vertical motion of the air; the mill will turn to a position where the wind will tend to hold it and prevent rotation, even should it be acted upon by a real vertical component of motion of feeble influence.

Finally, the vertical component of motion is at best very small, and any anemometer to measure it should be very sensitive. The instrument of the Dechevrens pattern furnished to the Weather Bureau by Richard is decidedly less sensitive than the anemometers commonly supplied to measure horizontal movement. The writer is of the opinion that a much more sensitive type of instrument is required.

It is hoped that the full report of the observations on the island of Jersey will show how and to what extent the several difficulties and sources of error discussed above have been overcome and eliminated.

So far as known to the writer the vertical movement anemometer has never been subjected to actual experimental calibration. The interpretations of its indications are based entirely upon a theoretical computation of the movement of wind per revolution of the mill depending upon the pitch of the blades. Until such an assumption is shown to be justified by experimental data the interpretation of the observations must be somewhat uncertain.—*C. F. Marvin.*

A STUDY OF SOME ERRORS OF KITE METEOROGRAPHS AND OBSERVATIONS ON MOUNTAINS.

By HENRY HELM CLAYTON, Meteorologist of the Blue Hill Meteorological Observatory, dated April 3, 1904.

In order to get the best results from the records obtained in the free air by means of kites at Blue Hill, the errors to which the records are subject have been carefully studied. Since the methods and conclusions derived from this study may be of service to others undertaking such investigations, it seems well to publish the results promptly.

It appears to be a common belief that errors may be eliminated from any set of measurements by taking hundreds of observations and averaging them. But this only eliminates the accidental plus and minus errors of equal frequency and value. Errors in one direction, or constant errors, are the rule and not the exception. Accordingly, in reducing the kite records obtained at Blue Hill great effort has been made to eliminate these constant errors. The reduction of the records has, therefore, been a much slower and more tedious undertaking than would otherwise have been the case.

Six possible sources of constant error have been recognized as influencing the records. These are (1) instrumental errors, (2) errors in exposure of instruments when comparing with standards, (3) errors in reading from meteorograms, (4) errors due to the local environment, (5) errors due to the observations being limited to certain weather conditions, (6) errors in determining vertical gradients, due to simultaneous changes in weather conditions at various heights while the instrument is moving vertically from point to point in the atmosphere.

(1)—INSTRUMENTAL ERRORS.

The meteorograph used at Blue Hill was made by Mr. S. P. Fergusson, and has been carefully calibrated, as described in the Annals of the Harvard College Astronomical Observatory, vol. 43, part 3. But in the rough usage attending kiteflying the instrument may be injured, and it is necessary to examine instrument and records after each flight for indications of such displacement of parts as would give rise to error. Changes in the positions of the recording pens in relation to the lines of reference on the charts are determined by comparing the meteorograph with standard instruments in a standard shelter before and after each flight. The differences are applied as corrections to reduce the readings of the meteorograph to those of the standard instruments. The errors of range are more difficult to detect than simple displacements of the zero of the scale, but are very important, because the instrument is likely to encounter much lower temperatures and humidities in the upper air than are encountered at the ground, and, if the corrections found at the ground do not remain the same aloft, where the readings are much lower, considerable error may result. The temperature and humidity usually change considerably between successive kite flights, so that this gives an opportunity for roughly testing the range each time. If any change is suspected, the instrument is recalibrated. Errors due to the flexure of parts of the instrument under various strains are also carefully sought for; such errors may be large unless the instrument is carefully built. In certain cases corrections are needed for the sluggishness of the instruments, but as there is risk of additional error in applying these corrections it has not been attempted at Blue Hill, except in the case of the humidity when the correction was apparent. On the other hand, an attempt has been made to avoid this error

by ascertaining experimentally how long a time was needed for the instrument to acquire the observed conditions, and then reading the meteorograph curves at places where the instrument was stationary in height for the proper length of time.

(2)—ERRORS IN EXPOSURE OF INSTRUMENTS.

The best method of comparing the instrument with a standard is in a closed box with thick walls where the temperature is changing slowly and an active air circulation is kept up by means of a fan. This method was tried for a while at Blue Hill, but, owing to its inconvenience, the method most used is to compare the recording instrument with the observatory standards in the thermometer shelter in the open air. The free air near the earth's surface during the daytime is a confused mass of ascending and descending air currents of slightly different temperatures and humidities. These currents passing through a thermometer shelter cause rapid oscillations in temperature and humidity, and make it very difficult accurately to compare instruments in different positions and of different degrees of sensitiveness. The comparisons can be made much more accurately at night, and it is now customary at Blue Hill to compare the recording instrument with the standards during the evening or very early morning preceding the kite flight, and again during the evening following the kite flight. Another method of comparison which has been used elsewhere is to suspend the instrument in the kite before leaving the ground, and then with a psychrometer whirled in the open air near the kite determine the corrections necessary to apply to the recording instrument. This method is subject to considerable error, because the meteorograph in such a situation records a temperature two or three degrees higher than that shown by a thermometer in a shelter about a meter above the ground. This may be proved by exposing the meteorograph in the shelter and then in the kite while lying on the ground. The Fergusson, Richard, and Marvin meteorographs have all been tried in this way and give similar results. The thermograph tube in the Marvin meteorograph is perhaps better protected from terrestrial radiations than the others near the ground, but this instrument also shows the heating distinctly, even in midwinter when the insolation is weak, as

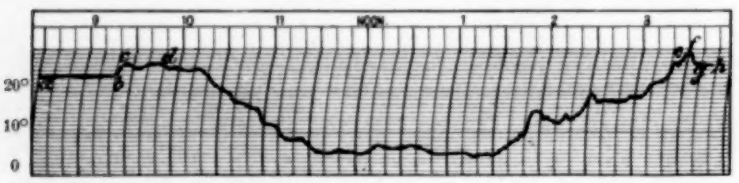


FIG. 1.—Influences of exposure of meteorograph.

can be seen from the accompanying chart, fig. 1, recorded on January 8, 1903. During the interval marked *a b* the thermograph was in the thermometer shelter; during the interval *c d* it was tied in the upper part of the kite which was lying on the ground; during the interval *d e* the kite and meteorograph were in the air at varying distances from the ground; during the interval *e f* the kite was again lying on the ground with the instrument suspended in it; and during the interval *g h* the instrument was again in the shelter. Now during the intervals *c d* and *e f* the temperature recorded by the kite meteorograph was evidently too high, and if, when the instrument is in such a position, a correction is found by means of a sling thermometer or a thermometer in a shelter, this correction will be too large to be applied to the records obtained when the kite is flying freely in the air and the corrected readings will all be two or three degrees too low. The result of applying a correction in this way would be to show an abnormal gradient in the temperature between the earth's surface and the place where the first value is derived from the kite record in the free air. In such a case the vertical gradient near midday might appear to exceed the adiabatic rate very greatly. The same result will follow if no correction is applied to the thermogram and the curves are read and used as they are recorded. It is found at Blue Hill that the greater the care taken to eliminate these errors the more nearly does the vertical gradient during the day approach the adiabatic rate.

(3)—ERRORS IN READING FROM METEOROGRAMS.

The greatest source of error in reading off the meteorogram is the time error. The different pens of a meteorograph rarely have the same time error, so that if on the same chart the heights are read from the barogram and the temperatures from the thermogram and the same correction for time error applied to each, the temperatures may be constantly too high or too low for the same altitudes above sea level. Furthermore, serious errors may be made in reducing the records of the meteorograph to the heights determined from theodolite measurements made at the ground, unless the time errors are accurately known. In order to keep a check on the time and allow for the sluggishness of the instruments, stops of five minutes or more are made from time to time when letting out the kites or reeling in. In addition, observations are made every minute during a large part of each kite flight at Blue Hill when the kites are visible, so that every rise and fall of the kites can be detected on the meteorogram. Another error in reading the charts arises from the thickening of the trace due to different degrees of vibration of the kites. In some cases error can be avoided by reading the middle of the trace, but in other cases the vibrations are not symmetrical on both sides of the mean, and experiments must be made to determine the proper portion of the trace to read, or the proper allowance for error. The stability of the kites and the rigidity of the instruments have recently been so much improved that this difficulty is not a serious one except in very high winds near the ground.

(4)—ERRORS DUE TO THE LOCAL ENVIRONMENT.

The place from which kites are flown may be subject to certain local conditions which would lead to error in interpreting the records. For example, the air immediately above a hill or mountain may be occasionally or permanently colder than the normal condition in the free air at the same height. Dr. Berson has shown that the temperature in the free air on the Brocken is lower than that found at the same height in the free air from balloon ascensions (Wissenschaftliche Luftfahrten, Band III, S. 89), and Mr. Dines has found that the temperature on Ben Nevis is lower than the temperature of the free air at the same height at a distance from the mountain.[1] At Blue Hill during the daytime, when ascending and descending currents are indicated by the kites, the temperature falls very uniformly with increase of height until a height of several hundred meters, usually the top of the ascending currents, is reached. When this uniform rate of fall is extended downward to the level of Blue Hill the temperature indicated for the free air agrees closely with the temperature observed on the hill. Moreover, when the vertical gradient of temperature is plotted by joining the temperatures recorded at the Blue Hill valley station with the temperatures recorded at the kites from 200 to 500 meters above sea level it is found that the interpolated temperature at the height of Blue Hill agrees closely with the observed temperature. The valley station is in a broad open valley and is about 15 meters above sea level. But probably the best test of this matter has been obtained during the past two years when temperature records simultaneous with those at the kite have been obtained at the top of a wooden tower built by Mr. Rotch near the base of Blue Hill. The top of the tower is about 30 meters above the general level of the surrounding land, and the exposure is as near

[1] Nature, vol. 68, p. 155.

a free air exposure as can be obtained. By plotting the temperatures observed simultaneously on this tower (78 meters above sea level) and at the kite, the temperature of the free air at 195 meters above sea level can be read from the plot and compared with the temperature observed at the same level on Blue Hill. The results are as follows, the minus sign meaning that the temperature on Blue Hill was lower, and the plus sign that it was higher than the interpolated temperature of the free air at that height:

	1902.				1903.			
Date	Aug. 7	Sept. 4	Nov. 6	Dec. 4	Jan. 8	Feb. 5	Mar. 6	Mar. 26
Difference in °F.	−0.2	+0.1	−1.0	0.0	−0.3	+0.2	+0.1	−0.5

	1903.						Mean.
Date	April 2	May 7	June 4	July 2	Dec. 3	Feb. 4	.....
Difference in °F.	0.0	+0.1	0.0	+0.2	−0.1	0.0	−0.1±0.1

Most of these differences are the means of the results obtained during the ascent and the descent of the kite in each case. These figures indicate that during the day when the air currents are ascending and descending freely and the adiabatic rate of decrease prevails in the air the temperature on Blue Hill does not differ appreciably from the temperature of the free air at that height. In no case has the temperature on Blue Hill been found appreciably higher than that indicated for the free air.

At night, however, the temperature on the hill is lower than that of the free air at the same height. This can be ascertained by interpolating the temperature between the tower and kite, or more directly by comparing the temperature on Blue Hill with that recorded simultaneously by the kite meteorograph when it sank to the level of Blue Hill in the free air at a distance from the hill, as happened occasionally when the kites broke away and the flying line caught on some object in the lowlands. The following results were determined by the latter method. The minus sign indicates that the temperature on Blue Hill was lower than that in the free air:

Year.	1897.	1898.	1900.	1900.	1901.	Mean.
Date	Aug. 17.	Sept. 30	Sept. 21	Sept. 21	Nov. 8	.....
Hour	10:50 p. m.	3:10 a. m.	9:17 p. m.	10:12 p. m.	9:17 p. m.	.....
Temperature in °F	−2.3	−7.0	0.0	−4.7	0.0	−2.8

This cool stratum is usually not more than 50 to 100 meters thick. When the kites are being reeled in at night the kite meteorograph generally shows a uniform rise of temperature with descent until it is within less than 100 meters of the top of the hill, where a sudden fall of temperature occurs.

The fact that the air immediately above the hill is not appreciably heated during the day appears to prove that there is no heating of the air by radiation from the hill itself in addition to the heating by radiation from the ground in general. Conversely, since poor absorbers are poor radiators it may be inferred that radiation from the air to the hill does not cause a cooling in excess of cooling of air in general at the same height. The air passes too rapidly over the hill for radiation to act to any appreciable extent.

The observed cooling might result from either one of two distinct causes or from both combined. (1) The air blowing across the hill may be cooled by contact with the surface of the hill which is chilled by radiation. (2) The air striking the sides of the hill may be driven upward and cooled adiabatically when the decrease of temperature in the free air with increase of height is less than the adiabatic rate. This latter cause of cooling seems to be the chief one, because when the adiabatic rate does not prevail in the free air, the cooling above the top of the hill appears in the daytime. On December 8, 1900, when the sky was covered with dense nimbus clouds and a strong southerly gale prevailed, observations between 11 a. m. and 1 p. m. showed that the air was cooler on the hill than at the kite between 100 and 200 meters above the hill, or at the valley station 180 meters below the hill. The tower station was not in operation at that time. At 11:46 a. m. the temperature on the hill was 1.7 °F. lower than at the kite 127 meters above the hill. Again on November 6, 1902, under similar weather conditions at 4:40 p. m. the temperature was 0.8° F. lower on top of Blue Hill than at the kite 205 meters above the top of the hill, and was 3.0° lower than at the tower station, 117 meters nearer sea level than the top of the hill. The temperature on the hill was also 3.1° F. lower than that at the valley station, and 2.0 °F. lower than that of the free air at the height of the hill as determined by interpolation between the kite and tower. If cooling by contact with the soil were the cause of these differences the cooling ought to have been greatest at the valley station. It is interesting to note in this connection that the adiabatic rate prevailed between the valley and the hill, notwithstanding the fact that the time was within eight minutes of sunset, and the rate of decrease was much less than the adiabatic rate in the free air up to the height of 1500 meters. The same cooling at the top of the hill showed during a snowstorm with easterly winds on January 8, 1904, at 4:28 p. m., when Blue Hill was 2.8° F. colder than the free air as determined by interpolating the temperature between the tower and kite, which at that time was only 66 meters above the top of the hill. The adiabatic rate prevailed between the tower and the hill, but at no other point in the air.

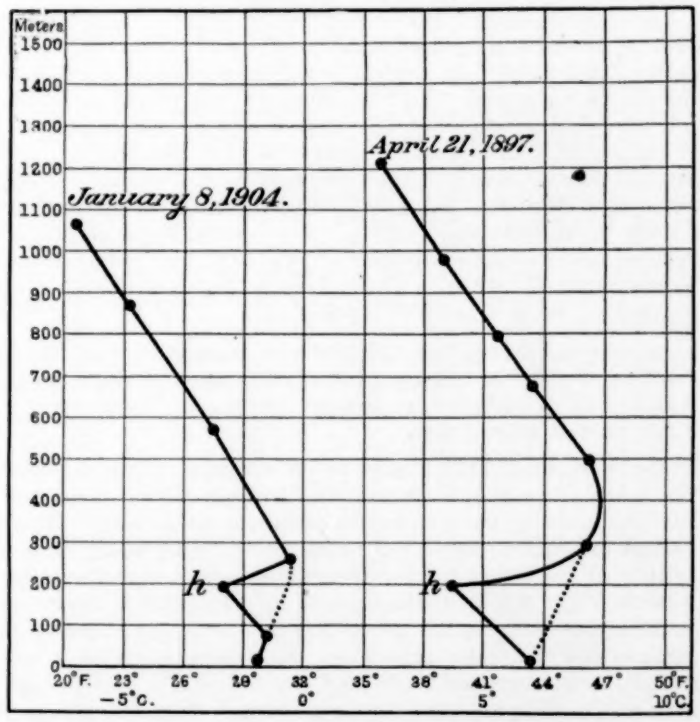


FIG. 2.—Distribution of temperature with altitude.

The vertical distribution of temperature as observed on the afternoon of January 8, 1904, is plotted in fig. 2, as is also the vertical distribution observed on the evening of April 21, 1897. The first is a good example of the cooling of the air above the hilltop during the day in cyclonic conditions, and the second a good example of the cooling of the air above the hilltop during the night. The continuous line connects the observed values while the dotted line indicates the probable temperature of the free air, which was evidently several degrees higher than that recorded at the top of the hill *h h*, 195 meters above sea level.

These results show that the mean temperature of the air on the hill must be lower than the temperature of the free air at the same height because the temperature on the hill never rises appreciably above the temperature of the free air but frequently falls considerably below it.

Since the mean temperature above every peak that has been compared with the temperature of the free air at the same height has been found cooler than the free air, it follows with a high degree of probability that the air above all mountain peaks averages colder than the free air, and as the chief cause is evidently the adiabatic expansion of air driven up the sides of the peak, the difference between the temperature of the peak and the free air probably increases with the height of the peak. From the conditions observed at Blue Hill it is easy to compute that the temperature above the tops of such peaks as Mount Washington, Pikes Peak, the Säntis, and the Sonnblick might be 15° to 20° F. colder than the temperature of the free air at the same height. At Blue Hill, and probably elsewhere, this cooling is greatest in cyclonic conditions when the wind is driven up the sides of the peak with greatest force.

If the air passing over a peak is cooled more than the surrounding air it will sink to a lower level than the top of the peak on the leeward side on account of the greater specific gravity of the cooler air. That this condition exists at Blue Hill is evident on days when clouds are passing somewhat above the summit of the hill. These clouds are seen to sink below the level of the top of the hill on the leeward side and do so for hours in succession.

(5)—ERRORS DUE TO THE OBSERVATIONS BEING LIMITED TO CERTAIN WEATHER CONDITIONS.

It is sometimes supposed that records obtained by means of kites are confined to certain weather conditions. For example, it is supposed that the records are obtained chiefly when the wind is above normal and not at all when the wind is very light. The kite, however, is not necessarily thus limited. The pressure, temperature, and wind velocity on the days of kite flights at Blue Hill do not differ in the average from the mean obtained from all the observations at the observatory taken in all conditions of weather; records have been obtained with the kites in all kinds of winds at the earth's surface, varying from a calm to a gale.

(6)—ERRORS IN DETERMINING THE VERTICAL GRADIENTS DUE TO SIMULTANEOUS CHANGES IN THE WEATHER CONDITIONS AT VARIOUS HEIGHTS WHILE THE INSTRUMENT IS MOVING VERTICALLY FROM POINT TO POINT IN THE ATMOSPHERE.

Since the weather conditions sometimes change rapidly while a kite is moving from point to point in the air, great care is needed in comparing records obtained at different levels; different conditions assumed to be due to differences of level may in reality be due to changes taking place simultaneously at both levels. A temperature gradient derived from the record of a kite meteorograph during the day may sometimes seem to exceed the adiabatic rate when the temperature of a large mass of the atmosphere is falling. For while a kite is rising from one point to another the temperature decrease shown by the meteorograph is the normal decrease with increase of height plus the decrease taking place in the body of the air.

The errors included under (5) and (6) will be considered in greater detail in the discussion of the observations in the Annals of the Astronomical Observatory of Harvard College, for which the above is a preliminary study.

MR. GIDEON S. JONES.

Mr. Gideon S. Jones, Assistant Observer, Weather Bureau, died at Columbus, Ohio, March 9, 1904, after an illness of three weeks, due to typhoid-pneumonia. Mr. Jones was born in Oxford, N. C., January 10, 1868. Most of his boyhood was spent at Madison, Wis. He entered the Weather Bureau in 1892 as an assistant observer. His duties were performed at the following-named points: Norfolk, Galveston, Charleston, Cincinnati, Yankton, Des Moines, and Columbus. He was a kind hearted and genial companion and popular with his associates.

THE TRANSVAAL OBSERVATORY.

By R. T. A. Innes.

This new meteorological institution is built on a range of hills 3 miles northeast of the city of Johannesburg. Its altitude is 5900 feet above sea level. Its latitude is 26° 6′ south. The instruments now being fixed there included a Sprung-Fuess barograph, a Dines-Baxendell anemometer and pressure plate, Callendar platinum resistance thermographs, Callendar sunshine recorder, Hoser lightning recorder of the type sent to the St. Louis Exhibition, Zeiss distance finder for work on clouds, Halliwell rainfall recorder, as well as complete sets of the more usual meteorological instruments. There are 24 outside barometer stations mostly at altitude of 4000 feet or more, and 198 rainfall stations, but the authorities are endeavoring to double this latter number in the coming season.

CLIMATE OF SIBERIA, KOREA, AND MANCHURIA.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Korea and Manchuria may be compared in area and latitude with the group of Atlantic States of the United States that extends from North Carolina to Massachusetts. The climate of this region differs materially, however, from that of the eastern part of the United States. In eastern Asia the summers are short, with warm days and cool nights, the spring and autumn seasons are transitory, and the winters are long and cold.

Meteorological records at Vladivostok, which has about the same latitude as Boston, fairly represent the climate of northern Korea and adjacent parts of Manchuria. In those regions the monthly mean temperature remains below freezing from October to April, and the surfaces of the rivers serve as highways of travel five and six months in the year. At Vladivostok the annual mean temperature is 40.2°, as compared with 48.6° at Boston. At Boston, however, the monthly mean temperature is below freezing only during December, January, and February, with the lowest mean, 27°, in January, as compared with 7.4° at Vladivostok for the same month.

THE COLD OF SIBERIA.

In Siberia, along the line of the Transsiberian Railway, the climate is very severe. Great mountains shut off this region from the moderating influences of the oceans to the east and south, and from October until late in the spring it is exposed to the sweep of cold winds from the Arctic Ocean.

Lake Baikal, which cuts the line of the railway, and the region thereabouts is subject to heavy falls of snow, and the monthly mean temperature is above freezing only during July, August, and September. During the three winter months the monthly mean temperature at Lake Baikal is below zero, with the lowest mean, 6.8° below zero, in January. As a result of the low temperatures Lake Baikal is usually frozen to a great depth by January and remains in that condition three or four months.

The maximum temperatures of the short summer seasons in Siberia, northern Manchuria, and northern Korea are quite high and frequently range above 90°, even as far north as Verkhoyansk, where the January mean temperature is 56.2° below zero and the lowest absolute minimum temperature noted on the earth's surface, 90.4° below zero, has been recorded. Over a great part of Siberia, in fact, mercury often freezes in November, while in December, January, and February mercury remains frozen for weeks together in southern Siberia.

MANCHURIA AND COREA.

Manchuria, as a whole, possesses many fertile valleys that

are watered by the rains of the southwest monsoon. In the plains region of southern Manchuria extremes of heat and cold are marked, although not so great as in the more northern parts of the country. The temperature rises above 90° in summer and falls to 10° or more below zero in winter, and rivers are frozen during the four winter months. After a short spring hot weather begins, which is separated from the severe winter by an autumn of about six weeks duration.

Niuchwang, Manchuria, which has about the same latitude as New York, has an annual mean temperature of 47.2°, as compared with 52.6° at New York. The monthly mean temperature continues below freezing at Niuchwang during December, January, February, and March, but at New York during January and February only. In July and August the mean temperature at Niuchwang, 77.7° and 74.4°, is 4.1° and 4.0° higher, respectively, than the means of the corresponding months for New York.

Korea is a mountainous, well-watered country, with practically no plain regions. Over the northern part of the peninsula winter temperatures fall to 10° to 15° below zero and the rivers are frozen for several months. In southern Korea temperatures fall nearly to zero during the winter months, and snow falls during a considerable part of the winter as far as the southern point of the peninsula.

Wonsan, the main port on the northeastern coast, near the latitude of Washington, D. C., has an annual mean temperature of 50.2°, as compared with 54.9° at Washington, and its July mean is higher than that of Washington. Owing to the proximity of Wonsan to the sea and its sheltered position to the eastward of the principal mountain range of Korea, its temperatures month by month correspond closely with the Washington record; each place presents but two months, January and February, with mean temperatures below freezing; in February the Wonsan temperature averages about 2° higher than that of Washington.

Fusan, in extreme southern Korea, has about the latitude of North Carolina, and its annual mean temperature, 54.5°, is about 5° lower than that of Norfolk, Va. The winter monthly mean temperatures do not fall below freezing at Fusan, the lowest, 33°, being that for January, as compared with 40.4° at Norfolk. The August mean temperature at Fusan, 76.8°, is 0.2° higher than the August mean at Norfolk.

Chemulpo, on the west-central coast of the Korean Peninsula, and Seoul, the capital, have about the same latitude as central Virginia. Seoul has the same annual mean temperature as Washington, with lower winter and higher summer temperatures. In January the monthly mean for Seoul is 24.3° as compared with 31.8° at Washington, and in July the Seoul mean is 81.1°, and the Washington mean 77°. Chemulpo temperatures average several degrees below those of Washington in winter, but correspond very closely with those of the same latitude on our Atlantic coast during the balance of the year.

THE WINTER OF 1903–4.

By W. B. STOCKMAN, District Forecaster, in charge of Division of Meteorological Records.

The winter of 1903–4 was an unusually cold one over the country to the eastward of the Mississippi River. This was not due to the occurrence of very low minimum temperatures, but to the number and succession of days whose mean temperatures continued below the normal. Over the Rocky Mountain slope district and thence westward to the Pacific Ocean, the mean temperature for each district was generally above the normal, and the average departures for the winter ranged from +0.6° to +3.9°. The details as to months and districts are shown in Table 1.

In the upper Mississippi Valley, and in all districts east of the Mississippi River, the mean temperature for each of the months of December, January, and February, except February in the Florida Peninsula, was below the normal, and generally to a marked extent; the departures of the averages of the whole three months ranged from —1.9° in the Florida Peninsula to —7.5° in the Lake region.

From month to month as the winter advanced the minus departures from the normal increased in the New England and middle Atlantic districts; they diminished in the Florida Peninsula, south Atlantic, and east Gulf districts; and varied in the Ohio Valley and Tennessee, Lake region, and upper Mississippi Valley.

TABLE 1.—*Departures from the normal for the several months and for the whole winter.*

Districts.	Departures from normals.			Winter.
	December, 1903.	January, 1904.	February, 1904.	
	°	°	°	°
New England	— 4.0	— 6.0	— 6.5	— 5.5
Middle Atlantic	— 4.8	— 6.1	— 7.4	— 6.1
South Atlantic	— 5.5	— 4.7	— 4.0	— 4.7
Florida Peninsula	— 4.8	— 1.6	+ 0.6	— 1.9
East Gulf	— 5.2	— 3.0	— 0.3	— 2.8
West Gulf	— 2.1	+ 0.5	+ 2.4	+ 0.3
Ohio Valley and Tennessee	— 7.6	— 3.9	— 5.0	— 5.5
Lower Lake	— 6.8	— 6.7	— 9.1	— 7.5
Upper Lake	— 7.0	— 5.3	—10.2	— 7.5
North Dakota	+ 0.2	+ 1.8	— 8.3	— 2.1
Upper Mississippi Valley	— 6.5	— 3.6	— 7.2	— 5.8
Missouri Valley	— 2.8	+ 1.0	— 3.3	— 1.7
Northern slope	+ 4.9	+ 6.5	— 0.1	+ 3.8
Middle slope	+ 1.4	+ 1.9	+ 4.2	+ 2.5
Southern slope	+ 1.8	+ 2.0	+ 7.9	+ 3.9
Southern Plateau	+ 1.0	— 0.1	+ 5.0	+ 2.0
Middle Plateau	+ 1.4	— 0.9	+ 3.7	+ 1.4
Northern Plateau	— 1.1	+ 5.6	+ 5.2	+ 3.2
North Pacific	+ 0.6	+ 2.4	— 0.8	+ 0.7
Middle Pacific	+ 1.4	+ 1.0	— 0.6	+ 0.6
South Pacific	+ 1.5	+ 1.6	+ 0.4	+ 1.2

The mean temperature was above the normal during each of the winter months in the middle and southern slope and south Pacific districts; in December and January in the north and middle Pacific and northern slope districts and North Dakota; in December and February in the northern and middle Plateau districts; and in January and February in the west Gulf districts.

At only two stations having twenty-five years or more of data was the record of lowest temperature broken.

At the following stations the minimum temperatures during January, 1904, were lower than during any preceding January since the establishment of the station:

TABLE 2.

Station.	No. of years of record.	Previous record exceeded by—
		°
Evansville, Ind	8	1
Hannibal, Mo	12	1
Harrisburg, Pa	16	1
Richmond, Va	6	1
Rochester, N. Y	33	2
Detroit, Mich	34	2
Northfield, Vt	18	6
Minneapolis, Minn	14	7
Binghamton, N. Y	8	15

No record of minimum temperatures at a regular Weather Bureau station was broken during the months of December and February.

Unusually high maximum temperatures were reported during December, 1903, from portions of Montana, Wyoming, and interior California; during January, 1904, from the mountains of West Virginia, and portions of the region to the westward of the Mississippi River; and during February, 1904, from portions of the slope, Plateau, and Pacific, and west Gulf districts, and, notwithstanding the marked negative departures from the mean for the month, in portions of Tennessee, Virginia, New York, and Maine. The details of these maximum temperatures are given in Table 3.

TABLE 3.—*Amounts by which the highest temperatures previously recorded for the specified stations and months were exceeded during the corresponding month of 1903–4.*

Station.	Month.	Number of years of record.	Previous record exceeded by—	Station.	Month.	Number of years of record.	Previous record exceeded by—
			°F.				°F.
Fresno, Cal	Dec., 1903	16	1	Meridian, Miss	Feb., 1904	15	1
Lander, Wyo	do	12	4	Palestine, Tex	do	23	1
Miles City, Mont	do	12	4	Richmond, Va	do	7	1
Amarillo, Tex	Jan., 1904	13	1	Tacoma, Wash	do	8	1
Carson City, Nev	do	17	1	Wichita, Kans	do	16	1
Dodge, Kans	do	30	1	Yuma, Ariz	do	29	1
Fresno, Cal	do	17	1	Eastport, Me	do	32	2
Corpus Christi, Tex	do	18	2	Pueblo, Colo	do	16	2
Lander, Wyo	do	13	2	Roseburg, Oreg	do	27	2
Palestine, Tex	do	23	2	Valentine, Nebr	do	18	2
San Luis Obispo, Cal	do	11	2	Albany, N. Y	do	31	3
Walla Walla, Wash	do	19	2	El Paso, Tex	do	26	4
Port Crescent, Wash	do	10	3	Binghamton, N. Y	do	8	5
San Diego, Cal	do	33	3	Dodge, Kans	do	30	5
Elkins, W. Va	do	6	4	Abilene, Tex	do	19	9
Helena, Mont	do	25	4	Amarillo, Tex	do	13	9
Fort Worth, Tex	do	6	5	Oklahoma, Okla	do	14	10
Knoxville, Tenn	Feb., 1904	34	1	Fort Worth, Tex	do	6	16
Little Rock, Ark	do	25	1				

Table 4 shows the dates on which the average temperature of each entire district was below the normal for that district, and Table 5 shows when it was decidedly below, during the several months.

TABLE 4.—*Dates when the temperature was below the normal throughout each district.*

Districts.	December.	January.	February.
New England	1, 2, 4–6, 11, 14–19, 23, 26–31	1–6, 11, 17–20, 25–30	1–6, 8–21, 25–27
Middle Atlantic	1–4, 6–12, 14–19, 26–31	3–12, 14–20, 25, 27–31	1–5, 9–21, 25–27
South Atlantic	1–4, 6–12, 14–19, 21–23, 26–28, 30	3–8, 12, 14–16, 18–20, 24, 25, 27–31	1–4, 9–14, 16–18, 20, 21, 27, 28
Florida Peninsula	1–12, 15–18, 21–23, 26–28, 30–31	1, 5, 6, 8, 9, 14–16, 24, 25, 30	1–4, 12, 13, 15, 24, 25
East Gulf	1–11, 13–18, 21–23, 26, 27, 30, 31	3–7, 13, 14, 23–31	1–4, 10–13, 15–17, 20–23
West Gulf	1–7, 9–11, 13–17, 20, 26	3–5, 23, 26–31	1, 10–12, 18–22
Ohio Valley and Tennessee	1–18, 22, 23, 25–31	3, 7, 13–15, 17, 18, 23–31	1–4, 8–13, 15–22, 25
Lower Lake	1–11, 13–19, 22, 25–31	1–6, 10–12, 15, 17–19, 24–30	1–4, 8–13, 15–20, 24–26
Upper Lake	1, 2, 5, 6, 8–17, 22, 25–31	1–5, 17, 24–31	1–4, 7–12, 14–20, 22, 24–27
North Dakota	4, 8, 11–16	1–4, 20, 23–28	2–4, 6–11, 13–16, 21–26
Upper Mississippi Valley	1, 2, 4, 5, 8–17, 22, 25, 26, 28–30	2–4, 23–31	1–4, 8–12, 14–22, 25, 26
Missouri Valley	1, 4, 5, 8–17	2–4, 21–29, 31	2, 3, 7–11, 14–19, 21, 25, 26
Northern slope	4, 11–14	2, 20, 23–25	2, 7–10, 14, 25
Middle slope	4, 5, 8, 12–14	2–4, 21–23, 25–29, 31	8–10, 16–19, 21
Southern slope	4, 5, 8, 9, 13–16	2–4, 6, 22, 23, 25–31	9–11, 18, 19
Southern Plateau	4, 5	3, 5, 6, 21–23, 29, 30	6–10
Middle Plateau	4–10, 15, 24, 25	9, 20, 21, 23, 25–31	8–10
Northern Plateau	3–10, 26, 27	25	9
North Pacific	2–11, 24, 25	18, 19, 25, 29	7–9, 20, 23–29
Middle Pacific	5, 6, 10, 30	3, 18–21	2–13, 17, 20, 27–29
South Pacific	3, 11	18–22	5–9, 12, 27

The most general, and, as a rule, severest cold spell of the month of January, 1904, began in the Pacific districts on the 18th, and continued in the several geographic districts as follows: North Pacific over the 20th; middle and southern Pacific over the 22d; middle Plateau 20th to 31st, inclusive, except the 22d; northern Plateau 25th to 31st, inclusive, except the 27th; southern Plateau 20th to 31st, inclusive, except the 25th; northern and middle slope 20th to 31st, inclusive; southern slope 21st to 31st, inclusive, except the 24th; North Dakota 19th to 28th, inclusive; Missouri Valley 20th to 31st, inclusive; upper Mississippi Valley, and west Gulf 22d to 31st, inclusive; the Lake region, Ohio Valley, and Tennessee, and east Gulf 23d to 31st, inclusive; south Atlantic 24th to 31st, inclusive; middle Atlantic and New England 25th to 31st, inclusive; and 24th, 25th, 30th, and 31st in the Florida Peninsula.

Overlapping and following the cold spells of the first six or seven days of the month of February, 1904, there were apparently a number of cold areas, so rapidly succeeding each other as to merge one with another, covering a much greater area, of longer duration, and marked severity, being especially severe in most of the districts on and immediately after the 15th.

Over the north and middle Pacific and the northern, middle, and southern slope districts the temperature was below the normal on the majority of the days of this month, but the daily departures were as a rule slight, and averaged only —0.8°, —0.6°, and —0.1° in the northern and middle Pacific and northern slope districts; in the southern and middle slope districts the plus departures were so very decided as to overcome the minus departures, and create an excess averaging +4.2° in the middle slope, and +7.9° in the southern slope.

TABLE 5.—*Dates when the temperature was 10° or more below the normal throughout each district.*

Districts.	December.	January.	February.
New England	15–18, 26–29	2–5, 18, 19, 28	6, 9–12, 16–18, 25–27
Middle Atlantic	15, 16, 27	3–6, 18, 19, 28	4, 9–13, 16–20, 25, 26
South Atlantic	2, 3, 11, 27	4–6, 19, 28–31	1, 10–13, 17, 18, 20
Florida Peninsula	1, 3, 4, 7, 8	14, 15	2
East Gulf	1–3, 6, 7	3–5, 26–30	1, 11, 12
West Gulf	2, 13, 14	3, 4, 26–29	19–21
Ohio Valley and Tennessee	1–3, 6, 10, 11, 13–15, 17, 26, 30	3–5, 26–28	1, 3, 4, 8, 10–12, 15–17, 19, 20
Lower Lake	13–16, 26, 28–30	2–5, 17, 18, 25, 27, 28	1, 3, 4, 8–12, 15–20, 25, 26
Upper Lake	11–15, 25, 28	1–4, 24–31	1, 3, 4, 7–12, 15–19, 24–26
North Dakota	4, 11–15	3, 20, 23–28	3, 6–11, 14, 15, 21–26
Upper Mississippi Valley	5, 10–15, 17, 25, 26, 30	2–4, 23–29	1–4, 8–12, 15–19, 22, 25
Missouri Valley	1, 4, 5, 10, 12–15	2, 3, 23–29	7–11, 14–19
Northern slope	12–14	24, 25	7–10, 14, 25
Middle slope	13, 14	2, 3, 25, 26, 28	9, 10, 19
Southern slope	15	2, 3, 28	10
Southern Plateau	None	None	None.
Middle Plateau	None	None	9
Northern Plateau	None	None	None.
North Pacific	None	None	None.
Middle Pacific	None	None	None.
South Pacific	None	None	None.

RECENT PAPERS BEARING ON METEOROLOGY.

Dr. W. F. R. PHILLIPS, Librarian, etc.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——.

Science. New York. New Series. Vol. 19.

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Byers, Charles Alma. Our Flood Warning Service. P. 23651.

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—— The Dawson-Lander Sunshine Recorder. Pp. 21–22.

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Maillet, Edmond. Résumé des observations centralisées par le Service Hydrométrique du Bassin de la Seine en 1902. Pp. 33–47.

Angot, A. Les observations météorologiques de la mission Saharienne Foureau-Lamy. Pp. 48–51.

Violle, J. Les appareils grélifuges à l'Exposition de Nuits-Saint-Georges. Pp. 59–62.

Chassant, —. Le régime des pluies et des vents pluvieux à Montpellier. Pp. 62–66.

Dechevrens, —. Les variations de la température selon la verticale. Une seconde altitude limite. Pp. 67–74.

Maillet, E. Sur la crue de la Seine en février 1904. Pp. 79–81.

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NOTES AND EXTRACTS.

EDITORIAL REVISION.

The authors whose papers appear in the MONTHLY WEATHER REVIEW will sometimes observe that changes have been made in their phraseology, sentences have been omitted, textual matter converted into tabular matter, explanatory notes added by the Editor, etc. As these changes have been made in good faith and under the conviction that they avoid introducing problematic questions, make the text of the article clearer, and increase its value to the readers of the REVIEW, therefore the Editor hopes they will not be taken amiss, and that his changes will not be considered as a case of officious meddling. No one can have the interests of the REVIEW more thoroughly at heart

than the Editor. His duty is to make it a medium of instruction to all. Whenever practicable, suggested changes in manuscripts have been referred back to the respective authors for their approval, but in a few cases this has not been practicable. In all cases the aim has been, not to put new ideas and words into an author's text, but to simply restate clearly the position that each author takes in reference to his own subject.

WIND EFFECTS.

Abstract of an article by MARK W. JEFFERSON, in the Journal of Geography, vol. 3, No. 1, January, 1904, pp. 1-20.

Climate may best be taught by inducing the student to observe and study the concrete facts of the weather. From these the characteristics of our climate may be deduced. The drawing of inferences from the facts, however, involves mental processes in which the beginner needs training. Familiarity with the inductive method is needed to give faith in it, and there is especial need of every possible test of the results. For this reason it is desirable to come to our conclusions by as many roads as we can find.

If it is desired to get the student to believe in our westerly winds as an important climatic feature, we may work along three lines:

1. Observe the weather vane and after some months find which wind has blown oftenest.

2. Study the weather map and make out on it the procession of highs and lows to the eastward.

3. Look at the trees that have grown exposed to the force of the winds for indications of thrust in one direction rather than in others.

To strengthen and confirm the somewhat vague and indefinite conclusions that the beginner may deduce from the first two methods, the evidence of the trees whose growth shows plainly the influence the prevailing wind is of the greatest value in teaching.

FIG. 1.—Maple at Ypsilanti, looking north.

The typical wind effect is not an inclination of the trunk, although this may appear where the ground is softened, either by moisture or by cultivation. The typical effect is a bending or inclining of the twigs to leeward, and for this reason the best season for these studies is after the fall of the leaf. Our prevalent westerly winds are recorded in the growth of the maples from New England to Michigan, fig. 1. The maple runs to slender and hairlike twigs, and the development of the twigs is almost horizontal on the east side of the tree and vertical on the west, as if they had been combed upward on the other, see figs. 1 and 4. Maples give excellent wind effects everywhere that I have observed them, and if there are any about Dodge, Kans., where the prevailing wind is easterly, it would be interesting to know how they grow.

The results of this wind influence are individual with each kind of tree. While the cottonwood, at least about Ypsilanti, is resistant to wind effects, its cousin, the white poplar, shows them in a high degree. In the poplar, curves are strongly developed, see fig. 2. On the east side of the tree, the branches form curves concave to the ground. On the west, vertical lines would cut not a few branches in two points with the curve between concave to the east, so strongly are they bent to leeward as they grow. In this case it is a branch effect rather than a twig effect, while the individuality of the poplar comes out in the curve. The maple succeeds better in rearing its greater branches vertically into the air. There is a distinct curving here, too, in the more slender branches, but much less in degree.

FIG 2.—White poplar, Ypsilanti, looking north.

FIG. 3.—Elm at Ypsilanti, looking north.

Elms are available for observation through a wide stretch of this country. The elm branches grow longer to eastward

than to westward, which enables the slender ends to hang nearer the ground on the east. The twig effect is not unlike that on the maple, but the greater length of the pendulous end twigs takes away the appearance of combing upward on the west side. The tips of the lower limbs on both sides hang directly downward, but toward the top of the tree the effects are almost identical with those observed on the maple. Fig. 3 is an example in twig. A photograph of the same tree from the west is quite symmetrical.

Wind effects may also be noted in the oak, the hickory, the sycamore or buttonwood, and the black walnut. Many tropical trees have their tops one-sided under wind influence, though they are one-sided to south or west instead of to east.

The best trees for observation are those standing alone in an open space, where they are not sheltered from the wind, and where the direction of their growth is not influenced by unequal lighting. Trees tend to grow strongly toward the light, but such observations as have been made seem to justify the statement that light usually has less effect on trees fairly exposed to the wind than the wind does.

These studies may afford a method of determining prevalent winds in regions meteorologically unexplored.

FIG. 4.—Wind effects.

NOTE.—These illustrations have been kindly loaned by the editor of the Jounal of Geography, but the numeration has been altered to suit this abstract.

ARGENTINE REPUBLIC WEATHER SERVICE.

The Weather Bureau has recently contributed two men to the meteorological office of the Argentine Republic. These are Mr. L. G. Schultz, who is to take charge of the magnetic service, and Mr. Montrose W. Hayes, Section Director, who goes to the central office, which is now established at Buenos Ayres, and who will probably also have charge of the forecast division. It is a pleasure to realize that there is a demand for men who have gone through the training implied in a long service in the Weather Bureau.

SEISMOLOGICAL WORK.

Under date of March 15 Prof. Dr. J. M. Perntner announces that by order of His Majesty, the Emperor of Austria, the seismological work hitherto supervised by the earthquake committee of the Imperial Academy of Sciences of Vienna will now be undertaken by the K. K. Zentralanstalt, and the official title of this institution is, therefore, changed to read as follows: "K. k. Zentralanstalt für Meteorologie und Geodynamik."

AVERAGES BY MONTHS OR BY SEASONS.

In a recent letter from Prof. Victor Raulin, of Montfaucon d'Argonne, France, who, since the death of Glaisher, is undoubtedly the oldest living meteorologist of Europe, he says:

> It is the custom of the meteorologists of Europe, and probably of the whole world, to group the twelve months into four seasons, beginning, respectively, with December, March, June, and September.
>
> It would be very interesting to determine and to mark out precisely each year the regions where droughts or excessive rainfalls prevail. For this purpose it would be necessary to begin by establishing a good average, for example, of twenty years, for a large number of stations in Europe. Then we should have to compare with this average the monthly or seasonal amounts of each of the years that have contributed to form it. By this means we should be able to determine the departures and their direction, and perhaps also to recognize some periodicity.

The question whether the twelve months of the year should be classified according to the meteorological year or the calendar year is, we think, still open for discussion. The individual months themselves seem to us more important than the four seasons of the year. But the question really depends upon what use we propose to make of the rainfall data. In all parts of the world there are some plants, some animals, some industries and other human interests that depend so closely upon the rainfall that we are continually tempted to make comparisons, in the hope of elucidating the complex relations and possibly discovering some law of importance to mankind.

In all such researches the proper attention to important details requires us to make use of monthly rainfalls instead of seasonal. There are other broader questions, such as the comparison of the local climates in different parts of the world, in which it may be allowable to consider only seasonal averages, but the publication of monthly means is certainly a primary duty, so that each may have the data that he needs in his study. For instance, in different portions of North America seed is sown or planted in different months, ranging from the early spring to the late autumn, and the development of any crop, depending as it does as much on the amount of water stored in the ground as on the current rainfall, requires us to consider the precipitation between certain definite dates, which do not agree with the beginnings of winter, spring, summer, or autumn, but may more appropriately be assumed to coincide with the beginnings of special months. On another page, for instance, we publish a study in local climatology by Mr. Emigh, of Dodge, in which he shows very plainly why monthly means rather than seasonal means must be used for Kansas.

A HAWAIIAN WEATHER BUREAU STATION.

A regular meteorological observation station of the Weather Bureau, under the charge of Mr. Alexander McC. Ashley, formerly local forecaster at Syracuse, N. Y., will be established at Honolulu. This station will be the center of the Hawaiian Climate and Crop Service, and will issue a weekly crop report and a monthly bulletin.

UNIFORMITY IN METHODS AND STANDARDS OF INSTRUCTION IN METEOROLOGY.

Attention has been called to the fact that instruction in meteorology is going on at nearly all the stations of the Weather Bureau. In some cases the observer has only his assistants under instruction; in other cases he gives a course of lectures to classes of high schools, colleges, or universities. It is desirable that in all cases the instruction should be consistent with the best methods of the service, and the best knowledge we have of meteorology. The multitude of official instructions, circular letters, elementary and advanced text-books issued during the past twenty years leaves opportunity for many sources of discrepancy and uncertainty. It is possible and desirable that uniform methods should be adopted at all stations, and that the instruction given in the college classes should be up to date. The general supervision of this whole subject may eventually be entrusted to some competent official; meanwhile, the editor will be very glad to hear directly from any one in the service who has felt the need of greater educational facilities, or who wishes to contribute his ideas and experience to the improvement of this branch of the work of the service. Those who have given courses of lectures should send in an outline or synopsis of these; those who wish to give courses should state the subjects on which they think lectures should be given; those who have had experience in the instruction of beginners in regular station work can, perhaps, suggest some improvements in this class of work. The need of a general school of instruction; the desirability of calling in the older members of the service, so that they may attend advanced lectures at the Central Office; the need of a special text-book to supplement those of Davis and Waldo;

the need of a general treatise on the more difficult problems in the mechanics of the atmosphere; the outline of a work on the special relations of the climate to the crops: these are among the numerous questions that will bear discussion.

In his recent testimony before the House Committee on Agriculture, January 16, 1904, the Secretary of Agriculture said:

> With regard to our educational work I want to call your attention to what we are doing in several States. It has been the theory of the Committee on Agriculture of the House that we should cooperate with the States, and we are doing a good deal of that; in fact, we are doing a great deal of it. We are not only doing that, but we are helping educational institutions throughout the country. Some years ago there was not a lecture delivered anywhere in the United States on meteorology. We have furnished the services of 14 gentlemen to lecture in universities and colleges in the States, for the purpose of having, eventually, scholars in the land along these lines.
>
> I gave instructions to Mr. Moore lately to bring those 14 gentlemen—they are observers in certain localities who incidentally lecture to these colleges and universities (Yale was the last institution that applied for one)—into a summer school in Washington and strengthen their lectures, so that when they go out to entertain classes they can do it with effect, to the end that some of those students in meteorology will find their way here and enable us to do better work some day.

WEATHER FORECASTS BY LOCAL OBSERVERS.

A recent letter from the professor in charge of meteorological observations and instruction at one of our cooperating colleges, and who is also a voluntary observer of the Weather Bureau, after enumerating the instruments and apparatus at his disposal goes on to say:

> We have gone to considerable expense, all by hard subscription, to make our equipment sufficient in the study of climatological conditions, and no effort shall be spared to add what may yet be wanting in the magnetic and seismic lines, not to omit the astronomical department, which is well under way.
>
> With the instruments on hand we have already been able to do some local forecasting, which very generally agrees with the forecasts from the Weather Bureau, but which is on the whole more accurate and reliable for our special locality, a fact which the community around begins to recognize. Now, if this observatory can be, over and above mere voluntary observation, of any service to the Weather Bureau, I am sure we will cheerfully place it at your disposal.

The above quotation presents a condition of affairs typical of that at many other institutions in this country. After thirty years of hard work, the Weather Bureau has been able to convince the people that the movements of the broad general features of atmospheric conditions can be forecast, and that too, profitably, by a discreet use of the information displayed upon the daily weather chart. Without this weather chart nothing at all could be done, but with its help one may foresee quite closely in what direction the front of a cold wave or of an area of rain or snow will move. We may often predict from day to day the motions of a whirling center of windstorm with a high percentage of accuracy, but the occurrence of rain or snow at any locality is a much more difficult matter.

The growing conviction that the atmosphere is subject to the laws of mechanics; that the weather can be predicted from day to day, and that eventually reliable long-range forecasts may be possible, has stimulated thought and research in all directions, and during these thirty years weather bureaus, weather maps, forecasts, and learned meteorologists have sprung up in all parts of the world. In our own country, a solid foundation for future progress is being made by the introduction of the study of meteorology into schools and colleges where it had hitherto been entirely neglected. This is the status of the institution from which the above quoted letter was received. It is doing a splendid work in stimulating the study of the subject, and among its students it will, we hope, raise up some who will be prominent meteorologists in the future. It desires to do forecast work, but it would be anticipating matters by a generation or two to imagine that a single observatory by itself can undertake with success the work of local weather predictions.

It is now a hundred years since the meteorological society at Mannheim finished its work of publishing that collection of daily observations which Brandes used in compiling his daily weather maps. From that time to this it has been evident that it is the combination of many stations into one chart that must be the basis of weather predictions. Only in the case of an isolated island like Mauritius does one feel driven by necessity to base a guarded forecast of an approaching typhoon on the local indications of pressure, wind, and cloud. The local forecasts made by every unofficial forecaster in the United States, so far as we have yet heard of them, depend upon the stars and the cycles, and are utter nonsense, or else they depend upon the daily weather map, and are only slight modifications of, or identical with, the official Weather Bureau forecasts. In fact, the Weather Bureau employs many men who are familiar with the study of weather maps, and it is hardly likely that these will on any given occasion fail to make as good forecasts as anybody else can make from the same data. Our work is open to all, and it is perfectly allowable for anyone to modify our forecasts or make new ones if he chooses for his own personal use, but it is certainly a very ungracious procedure for a man to make forecasts based on our data and then proclaim himself as superior to the Weather Bureau, or lead his community to think that he knows more about the subject than we. Such a course may magnify him in the eyes of his community; may bring funds and support for his college; may increase the circulation of the newspaper that publishes his forecasts; may increase his importance as a popular success, and yet, at the bottom, all his good work must depend upon the same data, rules, and laws that are employed by the Weather Bureau. The success of one forecaster and the failure of another is a matter peculiar to the man, not to the system.

The Weather Bureau is especially interested in having our colleges and universities prepare young men for future meteorological work in the Bureau by drilling them in meteorology and all the branches of physics that bear thereon. Of meteorology we may say something analogous to that recently said by Mr. George A. Damon of electricity; namely:

> The leaders in the various branches of the electrical industry during the first developments, when electrical work was an art and not a science, were graduates from the well-known university of "Hard Knocks." The men of the second generation of workers who are now doing things are largely the product of a semiscientific training in schools of technology, supplemented by experience of a practical nature picked up in a more or less haphazard way. A few years more will see the development of a third and better prepared generation of electrical experts, and it is safe to say that they will be the result of a combination of practical training thoroughly mixed with theoretical education. It must be expected that the next generation will be superior to the present one.

NEW ASTROPHYSICAL AND METEOROLOGICAL OBSERVATORIES.

The last number of Gerland's Beiträge zur Geophysik, vol. 6, p. 534, contains a short report on the establishment of an astrophysical observatory near Tortosa, in the Province of Tarragona, in eastern Spain (latitude 40° 48′ north, longitude 0° 33′ east of Greenwich). This observatory consists of a number of separate buildings for the respective instruments and observers that belong to the establishment. The institution is located on a delightful hill which overlooks the beautiful valley of the Ebro, and is, therefore, called the Observatory of the Ebro. The principal object of this establishment will be the study of terrestrial magnetism, considered not only by itself, but especially in relation to other phenomena, such as atmospheric electricity, meteorology, earthquakes, microseismic movements, and solar phenomena. Two buildings will be devoted to magnetic work; one to astronomical and solar work; a fourth to meteorology and atmospheric electricity; a fifth to the continuous register of thunderstorms, the record of earth temperatures, the polarization of sky light,

and the solar radiation as measured by actinometers. The building for the work in seismology will be entirely subterranean. The habitual purity of the sky, the entire absence of electric tramways, and of whatever may produce magnetic perturbations render this a favorable location. The observatory is in the neighborhood of the principal college of the Jesuits, namely, the college of higher studies, so that those who expect to be sent to the Observatory at Manila will receive preparatory education in observatory work. Fortunately, this observatory is also in the belt of totality for the eclipse of 1905, and it is hoped that everything will be in readiness for special work on that occasion.

In 1902 an important observatory for astronomy, geodynamics, and meteorology was established by the Society of Jesuits in Grenada, Spain, and its first annual volume of monthly bulletins for the year 1903 has been published. A still older seismologic station is a part of the marine observatory located at San Fernando, near Cadiz, Spain, and represents the high table-land of that region. At this station a Milne pendulum is established, whereas at the Ebro Observatory there is at present a microseismograph by Vicentini, and a horizontal pendulum by Grablovitz.

In so far as observatories for seismology, earth currents, solar phenomena, magnetism, tides, or astronomy maintain also records and studies bearing upon meteorology, we must welcome their indefinite multiplication. As yet we have but a fragmentary knowledge of the earth's atmosphere, and although it seems like accumulating an unmanageable mass of details, yet eventually all will be coordinated properly. The present state of astronomy is the result of just such a similar accumulation of details; crude records that are two thousand years old have been combined with those that are two hundred years old, and even with the most accurate work of the present day, in order to perfect our knowledge of the movements of the heavenly bodies. Just so it will be in meteorology. The data as to storms, the pressures, temperatures, and winds that have been recorded during the past fifty years will be combined with the more complete data and weather maps of the whole world that will be available to our successors, in order that they may understand more perfectly than we the movements that appear to us so irregular and accidental.

A NEW MOUNTAIN OBSERVATORY.

By the joint efforts of the Italian Alpenverien, the Duke of Abruzzi, the Minister of Agriculture for Italy, and Queen Margarhita, a geophysical observatory on the summit of Monta Rosa, at an altitude of 4560 meters (14,961 feet), has at last been erected. It is the highest in Europe except that of Vallot on Mont Blanc, and higher than the station on Pikes Peak formerly occupied by the Weather Bureau. The regular observational activity will begin in the summer of 1904. Young men expert in meteorological and physical laboratory work will be appointed as assistants. It will be occupied in the winter time as well as in the summer if the severity of the weather does not prevent. Both the observatory and the hut of refuge for mountaineers will be accessible, not only to Italian but to foreign students who wish to carry on geophysical investigations therein. In fact, it was used for that purpose last summer. The meteorological observations are expected to be of especial importance in connection with the simultaneous international balloon ascensions. Italy now possesses three mountain observatories, namely, Monta Rosa, 4560 meters; Ætna, 2942 meters; Cimone, 2162 meters.

KITE ASCENSIONS AT KAZAN.

During the summer and autumn of 1893 a Richard meteorograph was sent up to considerable heights at the University of Kazan by Prof. V. A. Uljanin, professor of physics and director of the meteorological observatory. The Hargrave kites were used, with surfaces of about two to three meters square. The meteorograph was carried either between two small kites or by one large kite. The first four ascensions gave the following general average temperature gradient per 100 meters altitude:

1903, July 18, 1.23° C., up to 858 meters.
1903, September 1, 0.88° C., up to 635 meters.
1903, September 5, 1.08° C., up to 1270 meters.
1903, October 1, 0.85° C., up to 766 meters.

POLARIZATION OF THE LIGHT OF THE SKY.

The observation of the polarization of sky light is a matter that has interested meteorologists ever since the early work by Arago, Babinet, and Brewster; it seemed to promise to give us some information with regard to the moisture, the dust, the mixture of warm and cold air, and even, according to the latest studies, the nature of the gases that are mechanically mixed together in the atmosphere. The latest contribution to this subject is published in the Meteorologische Zeitschrift for March, 1904, namely a series of observations on the polarization of sky light made by Dr. G. Sack in Lubeck. These are a continuation of the studies made by Dr. Busch in 1886–1889, which latter were stimulated by the optical effects produced by the volcanic eruption of Krakotoa in 1883. The work of Dr. Sack began as soon as he heard of the eruptions of Mount Pelée, Martinique, and Soufriere on St. Lucia, in the summer of 1902. He determined the neutral points of Babinet and Arago by means of a Savart polariscope. The observations extend from September, 1902, to the end of August, 1903, and the following general conclusions are announced by Dr. Sack:

1. The distances of Babinet's point from the sun and of Arago's from the antisun change in the same direction with the position of the sun at the time of its rising and setting.

2. The general law announced by Dr. Busch (Meteorologische Zeitschrift, December, 1886), can be expressed more generally as follows:

> The distance of the Babinet point from the sun increases until the sun is at a slight altitude above the horizon, when it has its maximum value, and decreases as the sun departs from this position; the distance of the Arago point from the antisolar point decreases until the sun attains a slight altitude below the horizon, when it has its minimum value, and increases as the sun departs from this position.

3. The effect of the eruption of the West Indian volcanoes is recognized by an astonishing increase in the distance of the Babinet point from the sun and a decrease of the distance of the Arago point from the antisun.

It will be remembered that in 1892 the Weather Bureau had an opportunity to employ one of our most distinguished American physicists, Prof. Carl Barus, now at Brown University, upon various problems in meteorology, especially the method and process of condensation of aqueous vapor in the atmosphere. A preliminary notice of his work was published in a report of the Chief of Bureau, 1891–2, pp. 526–8. His first results were published in the Weather Bureau Bulletin, No. 12, "Report on the Condensation of Atmospheric Moisture," by Carl Barus, Washington, 1895. The dates of the preface are May 1, 1893, and April, 1895, and the report presents the results of much work done after the position occupied by Dr. Barus had been abolished by Secretary Morton; he having been able to continue his work at his own expense, with some considerable assistance from Prof. Alexander Graham Bell. Bulletin No. 12, presenting the results obtained up to 1895, has been followed by a series of equally interesting and important papers published either in the London, Edinburgh, and Dublin Philosophical Magazine, or in the Contributions of the Smithsonian Institution. The latest results of this research, which is still being actively prosecuted, were communicated to the Ameri-

can Physical Society at its meeting on February 27, 1904. The following is quoted from Science, April 1, as a summary of that paper, "On the microphotography of fog particles and the photographic study of atmospheric nucleation."

The author gave a description of his apparatus and methods, and illustrated the results by a series of ten lantern slides and many positives showing the microphotographs of fog particles. Most of these were strikingly distinct, the water globules ranging in size from about 0.0002 centimeters to 0.002 centimeters, according as fogs of different degrees of fineness were precipitated. The most highly graded nuclei, as shown by the presence of fog particles of all sizes, were obtained by an exposure of dust free air to the X rays from one to ten minutes, depending on the intensity of radiation. Much greater uniformity in the series of the nuclei is shown in the cases of phosphorus and ordinary air nuclei.

The author described a number of curious phenomena observed with these water particles, among which their continued motion when caught on a film of liquid oil, simultaneously to and fro between edges of the film, is most noteworthy. Particles moving in swarms in opposed directions are often in the focus of the microscope together, and thus lie very nearly in the same plane. The author finally remarked that the coronal method had now been so far perfected that the nucleation increment produced by a single gas flame in a moderately large lecture room could be detected in about ten minutes, even in the air collected from near the floor. This favorable quantitative result may then be supplemented qualitatively by the photographic method, which will show the presence of exceptionally small or large particles, whose effect vanishes from the corona as they are relatively few in number.

THE WINTER OF 1903–4 AT THOMPSON, WINDHAM COUNTY, CONN.

It is well known that one of the longest temperature records in New England is that kept by Miss Ellen D. Larned for over fifty years at Thompson, Windham County, Conn. A short note from her states that the past winter has been the coldest within the last half century. "We have been less afflicted with high winds and severe snowstorms than in some sections, but had excellent sleighing from December 30 to March 3." The following is the temperature record:

December, 1903, mean	23.4°
January, 1904, mean	17.9°
February, 1904, mean	18.6°
Mean	20.0°

During the years 1852–1904, the coldest December was in 1872, mean temperature, 20.6°; the coldest January was in 1857, mean, 10.8°; and the coldest February was in 1901, mean, 18.1°. Although the general average of the present winter is the lowest on record, yet the individual months have been exceeded.

Other cold winters, according to Miss Larned's records, are as follows:

1856–57, mean	22.3°
1867–68, mean	21.4°
1872–73, mean	22.5°
1874–75, mean	22.0°
1892–93, mean	20.7°

The warmest winter was 1889–90, mean, 31.7°.

LOCAL STORM AT PORTLAND, OREG.

Mr. E. A. Beals, District Forecaster at Portland, Oreg., describes a windstorm, or incipient tornado, which passed through the eastern portion of that city on February 26. A low pressure area was central that morning off the northwest Washington coast. Therefore Portland was in the southeast quadrant of the cyclonic disturbance and about 400 miles from its center.

At 10:42 a. m., local time, a very black, low cloud was observed at the station, passing rapidly toward the east-northeast. The barometer rose suddenly .04 of an inch and then fell rapidly to the starting point. Wind and temperature, also, fluctuated rapidly, and heavy hail fell for about three minutes.

The greatest destruction occurred about 4 miles from the station, in what is known as Barretts Addition, where two houses were destroyed and others damaged. While the distribution of the débris did not positively indicate gyratory winds, the force exerted appeared to be greater than is probable in a straight line blow. The houses destroyed were not very substantially built. The trees prostrated varied in diameter from 3 inches to 1 foot. They were all coniferæ with bushy tops. Those that were broken off were small in size and where broken gave no indication of being subjected to a twisting force. The storm came from the west-southwest and moved toward the east-northeast. The tops of the trees to the right of the center of the storm track pointed a trifle to the east of north, and those to the left of the center pointed a trifle to the west of north.

Witnesses describe the cloud as very black and close to the ground; some of them noticed a single flash of lightning, but only one observed any whirling motion or funnel shape. They agree that the rain was very light before the storm, but quite heavy for about fifteen minutes after it had passed. Heavy hail began to fall just before the wind struck the buildings. It was oval in shape and about the size of marbles. One person saw *two* clouds, which approached each other from the northwest and southwest, and, after meeting, seemed to roll down almost to the ground and then move rapidly toward the northeast.

The width of the path of destruction was 200 feet and the length nearly ten miles. In the center of its path there were houses as well as trees that escaped injury, and the people living in them did not notice that the storm was uncommonly severe. There were no lives lost, but several people were slightly wounded. The damage to property amounted to about $5000.

BRIGHT METEOR OF SEPTEMBER 15, 1902.

Mr. E. L. Mosely, of Sandusky, Ohio, has made a special study of a remarkable meteor that passed northward over eastern Ohio about 5.42 a. m., September 15, 1902, and was seen by observers in Michigan, Ontario, Indiana, Pennsylvania, New York, and West Virginia. He desires as many additional records as possible. Will not all who read this paragraph kindly examine their old records, diaries and memoranda, scrap books, and local newspapers, and send Mr. Mosely whatever they find bearing on this meteor? The mere fact that it was seen or heard will be of value. Many times, when the sky is covered with clouds, the observer merely hears a great noise, like an explosion, and knows not the origin of the noise. Sometimes it is attributed to an earthquake; at other times to the blowing up of a distant powder mill or steam boiler; sometimes the windows rattle and it is spoken of as an earthquake. Whatever happened on the morning of September 15, 1902, over a region between western North Carolina and upper Michigan and Ontario, should be examined with reference to its possible connection with this meteor. To very distant observers it may have seemed merely like a bright shooting star.

HYPOTHESES AS TO THE CAUSE OF THE AURORA BOREALIS.

In the Bulletin of the French Society of Physics for 1903, pp. 184–220, Mr. Charles Nordmann, an employee of the Astronomical Observatory at Nice, reprints a thesis lately presented by him to the faculty of sciences at Paris. He develops arguments in favor of the hypothesis that the aurora, as observed on the earth, is the result of Hertzian waves that emanate from the sun, and that are registered regularly at the magnetic observatories, just as the ordinary electrical phenomena of the atmosphere are recorded at other observatories. He has tried to prove logically that the sun sends out such Hertzian waves of greater intensity from the regions, and at the epochs, of the greatest solar activity; that is to say, from the regions of spots and faculæ and at the moments of the maxima of solar spots. He finds that the form and orientation of the detailed struc-

ture of the aurora, its extension, frequency, and height, its spectrum, its diurnal, annual, and sun-spot periodicity, and its relation to the magnetic pertubations, all harmonize with this conclusion. Recent fundamental researches by Paulsen into the relation between cathodic discharges and optical appearances analogous to auroras have given rise to the two theories proposed by Arrhenius and Birkeland, respectively, which attribute a preponderating role to the cathode rays emanating from the sun, but these theories are not perfectly satisfactory and Nordmann suggests necessary modifications.

The theory of Arrhenius is based upon the hypothesis that the sun by reason of the Maxwell-Bartoli pressure (sometimes spoken of as the pressure of light) emits particles that are charged negatively, whose diameters are of the order of $\frac{1}{1000}$ part of a millimeter, namely, one micron; these arrive with their negative charges at the earth, and under the influence of the ultraviolet radiation from the sun they are discharged into the upper atmosphere and produce the cathode rays.

The theory proposed by Birkeland has some resemblance to the older theory of August de la Rive, which has been modified by many savants in order to adapt it to the demands of modern knowledge. Birkeland attributes the aurora to electric currents, but not to those circulating in the ground or in the lower atmosphere, but to those that are restricted entirely to the upper atmosphere and circulate there very nearly parallel to the ground. He also considers the sun the source of these currents, whereas other authors attribute them to causes that are exclusively terrestrial. In order to explain the diurnal and 11-year period of the aurora, Birkeland thinks that the electric currents are produced by the cathodic rays emanating from the sun.

If there be a rotation of the solar nucleus, there should be a corresponding periodicity in the magnetic perturbations and in the auroras, but Schuster has shown from the Greenwich observations for twenty-four years that there is no sensible period in these magnetic pertubations having a value anywhere between the limits 25.0 and 27.5 days at Greenwich. Hence, it would seem certain that there can be no solar magnetic influence. On the other hand, if we examine Birkeland's theory more carefully in view of the possibility of the production of auroras by electric currents in the upper atmosphere, we see that every time that an aurora is visible there should also be a magnetic perturbation due to the current that produces the aurora. But, on the contrary, in the regions where auroras are most brilliant and most frequent, they produce the least magnetic perturbation; hence, in place of these ordinary explanations Nordmann recalls that these Hertzian waves, such as we know ought to emanate from the sun, resolve all our difficulties. They have the power, exactly like the voltaic current, to make rarified gases luminous; an abundance of cathodic rays is produced in connection with the luminescence of the rarified gas produced by Hertzian oscillations; the atmospheric regions that are rendered conductive by solar Hertzian waves also have a movement with respect to the magnetic field of the earth by virtue of its induction. In general, the Hertzian waves from the sun explain the forms and orientation of the aurora and the details of its rays, the extension of the aurora over the globe, the frequency of the aurora, the time of maximum and minimum, the altitude of the aurora, the spectrum of the aurora, the diurnal and annual frequency; the 11-year period, the relation between the aurora and magnetic perturbations.

Professor Bigelow states that Nordmann's theory agrees with that which he has been advocating since 1890. The Hertzian waves from the sun are identifical with the "field of sunlight" of Professor Bigelow. The bombardment of the earth by ions from the sun, as is required by Arrhenius theory, requires too much of them.

Mr. Charles Chree, in the London, Edinburgh, and Dublin Philosophical Magazine for January, p. 77, states that the original doctorate thesis by Nordmann, in which the above theories are broached, while containing an abundance of references, and favorably reported upon by such eminent savants as H. Poincaré, Pellat, and Moissan, is yet quite unsatisfactory from some points of view. For instance, it is not logical to conclude that as sunspots increase, therefore the sun's thermal radiation must necessarily diminish. Nordmann's general law that the amplitudes of the diurnal variation of magnetic declination diminish as one retires from the equator is quite contrary to the general observations and belief of magneticians. In general he states that an intimate knowledge of all the subjects to which Nordmann applies his theories is perhaps rather too much to expect of any one man.

CORRIGENDA.

MONTHLY WEATHER REVIEW for January, 1904, page 10, column 2, line 19, for "oxygen" read "hydrogen;" line 20, for "hydrogen" read "oxygen." Page 16, column 2, line 16, change $\frac{\varpi}{\rho}$ to $\frac{P}{\rho}$.

MONTHLY WEATHER REVIEW, February, 1904, page 73, column 1, line 8, change 6.0377×180^{27} to 6.0377×10^{27}; line 26, change 29.80670 to 29 80670; line 29, change 9.77448 to 9.774448. Page 76, column 1, line 8 from bottom, change $0293r$ to $0.293r$. Page 83, column 2, line 8, for "Chart VII" read "Chart IV."

THE WEATHER OF THE MONTH.

By Mr. W. B. STOCKMAN, District Forecaster, in charge of Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and VI.

The mean pressure for the month was high on the Atlantic seaboard and low from southwestern Texas, New Mexico, and southeastern Arizona northwestward over the slope and Plateau regions to the coasts of Oregon and Washington.

The crest of the high pressure area overlay the Middle Atlantic States and North Carolina. The pressure was lowest over the north Pacific region, with a secondary low area over the southern Plateau, and western portion of the southern slope region.

The pressure was above the normal in the Atlantic districts, northeastern Florida, eastern portion of the east Gulf States, central and eastern Ohio Valley and Tennessee, lower Lake region, and northeastern portion of the upper Lake region. In the remaining districts it was below normal.

The greatest positive departures from the normal ranged from +.10 to +.12 inch and occurred over southern New England and the northeastern portion of the Middle Atlantic States. The negative departures were more marked and ranged from —.10 inch in the southern and middle Plateau regions, in an increasing degree in a northwesterly direction to —.20 inch on the Washington coast. Over western Oklahoma and the panhandle of Texas the departures slightly exceeded —.10 inch.

The pressure slightly exceeded that of February, 1904, on the coast of New England, in northwestern Montana, and northern Washington, the greatest departures, +.05 to +.07 inch, occurring over northwestern Washington; over the remainder of the country the pressure diminished from that of the preceding month and in a much more marked degree, the greatest variations, ranging from —.20 to —.24 inch, were reported from the upper Mississippi and Missouri valleys, North Dakota, and the eastern portion of the middle slope region.

TEMPERATURE OF THE AIR.

The distribution of maximum, minimum, and average surface temperatures is graphically shown by the lines on Chart V.

The temperature was below the normal in New England, North Dakota, the northern slope, Plateau and Pacific, and middle Pacific regions, and below the normal in the remaining geographic districts.

From Lake Superior westward to Washington and southwestward to the interior of northern California the departures were very marked, and amounted to —11.1° in northwestern North Dakota, and —12.5° in north-central Montana. The positive departures were not so decided, but covered much more territory, and generally averaged over +2°, and in the middle and southern slope regions and west Gulf States more than +4°. The greatest excess occurred in interior Texas where it amounted to +8.9°.

Maximum temperatures of 90°, or higher, occurred generally in Florida, Texas, Oklahoma, south-central Kansas, southwestern Arizona, and southeastern California, and of 100° to 105° in the central Rio Grande Valley.

Minimum temperatures of zero, or lower, occurred in New England, northeastern New York, northern Michigan, Wisconsin, Minnesota, the Dakotas, and the northern and middle slope and Plateau regions. A minimum of —25° was reported from northeastern New York, and temperatures approaching that were reported from the States west of the upper Lake region.

The mean temperature for the month was higher than any preceding March by 1° at El Paso, Tex., Fort Smith, Ark., and San Antonio, Tex.; 3° at Abilene, Tex., Modena, Utah, Oklahoma, Okla., and Fort Worth, Tex., and 5° at Taylor and Amarillo, Tex., and lower by 1° at Lewiston, Idaho; 2° at Houghton, Mich.; 3° at Scranton, Pa., and 4° at Kalispell, Mont.

The maximum temperature recorded during the month was higher than any previous March by 8° at Elkins, W. Va., and equaled the record at Hatteras, N. C., Lincoln, Nebr., New Orleans, La., Palestine, Tex., and Tampa., Fla.

The average temperatures for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	8	31.5	— 0.5	—13.0	— 4.3
Middle Atlantic	12	39.5	+ 0.1	—13.4	— 4.5
South Atlantic	10	55.7	+ 2.2	— 6.5	— 2.2
Florida Peninsula*	8	69.4	+ 3.9	+ 2.7	+ 0.9
East Gulf	9	61.0	+ 3.4	+ 0.1	0.0
West Gulf	7	63.0	+ 5.2	+ 8.1	+ 2.7
Ohio Valley and Tennessee	11	46.5	+ 2.4	— 6.5	— 2.2
Lower Lake	8	33.7	+ 1.4	—14.4	— 4.8
Upper Lake	10	27.1	+ 0.4	—15.1	— 5.0
North Dakota*	8	18.0	— 2.3	—12.6	— 4.2
Upper Mississippi Valley	11	37.0	+ 1.2	— 9.6	— 3.2
Missouri Valley	11	38.5	+ 3.1	+ 0.8	+ 0.3
Northern Slope	7	30.2	— 1.6	+ 4.8	+ 1.6
Middle Slope	6	47.1	+ 5.0	+11.1	+ 3.7
Southern Slope*	6	57.7	+ 7.1	+13.0	+ 4.3
Southern Plateau*	13	50.9	+ 2.6	+ 8.0	+ 2.7
Middle Plateau*	8	39.5	+ 1.6	+ 4.5	+ 1.5
Northern Plateau*	12	36.0	— 1.2	+ 8.1	+ 2.7
North Pacific	7	42.0	— 3.0	— 1.4	— 0.5
Middle Pacific	5	50.3	— 2.0	— 1.6	— 0.5
South Pacific	4	55.6	+ 0.1	+ 2.1	+ 0.7

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Prof. R. F. Stupart says:

The temperature was slightly above the average on the north shore of Lake Superior, also locally in the Muskoka and Nipissing districts; average or a little below elsewhere in Ontario, and likewise in Quebec and the Maritime Provinces; below average in Manitoba, and very much below in the Territories and over the greater part of British Columbia. Edmonton recorded a negative departure of 11°, Calgary of 10°, and Swift Current of 8°, and in British Columbia, Barkerville and Kamloops both gave a deficiency of 5°.

PRECIPITATION.

The distribution of total monthly precipitation is shown on Chart III.

The precipitation was below the normal in the Atlantic and Gulf States, and the middle and southern slope and southern Plateau regions; and above normal in the remaining districts.

In the western portion of the east Gulf States the deficiencies ranged from —4.0 to —5.1 inches. In central Indiana the excess in precipitation amounted to over 7 inches, and on the northwestern coast of California to 12.9 inches.

No precipitation was reported from western Texas and southern New Mexico.

Snow in measurable quantities occurred except in the South Atlantic and Gulf States, the southern portions of the slope and Plateau regions, and southern and western California.

Measurable quantities of snow remained on the ground at the end of the month in New England, New York, upper and northern lower Michigan, North Dakota, and portions of the northern and middle slope and plateau regions.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 2, 3, 4, 6, 12, 13, 14, 20, 21, 22, 23, 26. Arizona, 12, 23, 30, 31. Arkansas, 1, 2, 10, 12, 13, 17, 19, 20, 22, 24, 25, 26, 31. California, 6, 7, 8, 10, 11, 19, 20, 21, 22, 23, 24, 27, 28, 29, 30. Colorado, 13, 20, 29, 30. Connecticut, 11, 22, 31. Delaware, 14. District of Columbia, 2, 14, 18. Florida, 3, 5, 14, 28. Georgia, 1, 3, 4, 13, 14, 21, 22, 23, 24. Idaho, 2, 8, 9, 11, 12, 14, 15, 18, 20, 21, 23, 24, 25, 28, 29, 30. Illinois, 2, 3, 10, 11, 13, 17, 19, 21, 22, 23, 24, 25, 30, 31. Indiana, 1, 2, 3, 13, 22, 25, 31. Indian Territory, 17, 24, 25. Iowa, 2, 21, 24, Kansas, 1, 9, 10, 13, 17, 24, 28, 29, 30, 31. Kentucky, 3, 6, 13, 19, 21, 22, 23, 24, 25, 26, 30. Louisiana, 1, 2, 3, 5, 6, 10, 13, 16, 17, 18, 20, 22, 23. Maine, 22. Maryland, 3, 14. Massachusetts, 3, 19, 22. Michigan, 2, 3, 21, 22, 24, 25. Minnesota, 2, 20, 21. Mississippi, 12, 13, 14, 17, 20, 21, 22, 23, 26. Missouri, 2, 3, 10, 13, 17, 19, 21, 22, 24, 25, 30, 31. Montana, 8. Nebraska, 24. Nevada, 1, 4, 6, 7, 8, 10, 18, 20, 23, 24, 27, 29, 30. New Jersey, 3. New Mexico, 23. New York, 1, 3, 10, 11, 21, 22, 31. North Carolina, 3, 10, 22. Ohio, 2, 3, 14, 21, 22, 24, 25, 26, 31. Oklahoma, 10, 16, 24, 25. Oregon, 1, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 30. Pennsylvania, 1, 3, 11, 21, 25. Rhode Island, 11, 12, 15, 22, 27. South Carolina, 11, 13, 14, 21, 23, 24. South Dakota, 24, 30. Tennessee, 3, 8, 10, 13, 21, 22, 23. Texas, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 31. Utah, 1, 2, 8, 9, 11, 15, 20, 22, 23, 24, 25, 28, 29, 30, 31. Vermont, 6, 7, 19. Virginia, 15, 22, 29. Washington, 1, 2, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 21, 22, 23, 24, 25. West Virginia, 6, 11, 12, 22, 31. Wisconsin, 2, 19, 21, 24. Wyoming, 4, 18, 29.

SLEET.

The following are the dates on which sleet fell in the respective States:

Arizona, 12, 23, 31. Arkansas, 25. California, 1, 4, 6, 8, 10, 11, 12, 19, 20, 21, 22, 23, 24, 26. Colorado, 5, 16, 31. Connecticut, 11, 31. Delaware, 14. District of Columbia, 14, 27. Idaho, 3, 20, 23, 27. Illinois, 11, 12, 13, 14, 16, 17, 20, 21, 25. Indiana, 3, 11, 12, 13, 14, 15, 17, 18, 21, 25, 30, 31. Iowa, 2, 3, 10, 13, 16, 17, 21. Kansas, 5, 13. Kentucky, 3, 10, 19. Maine, 1, 2, 7 20, 22, 23. Maryland, 3, 11, 14, 15, 17, 18, 21, 27. Massachusetts, 3, 11, 15, 19, 20, 22, 31. Michigan, 3, 10, 11, 17, 19, 21, 22, 25. Minnesota, 10, 13, 14, 15, 18, 19, 20, 21, 24, 25, 31. Missouri, 2, 5, 13, 16, 25. Montana, 8, 9, 20. Nebraska, 10, 12, 13. Nevada, 8, 11, 28, 29. New Hampshire, 7, 22. New Jersey, 1, 3, 11, 12, 14, 15, 21, 27. New

Mexico, 21, 31. New York, 1, 3, 7, 8, 11, 14, 15, 18, 21, 22, 31. North Carolina, 3. North Dakota, 8, 9, 12, 13, 24, 25, 30. Ohio, 3, 5, 12, 13, 14, 17, 19, 20, 21, 25, 26. Oregon, 3, 10, 17, 20, 21, 22, 23, 29, 30. Pennsylvania, 1, 2, 3, 6, 8, 10, 11, 14, 17, 19, 21. Rhode Island, 1, 11, 12, 27, 31. South Dakota, 10, 21, 24. Tennessee, 3. Utah, 1, 2, 4, 8, 10, 11, 14, 15, 19, 20, 22, 23, 28, 29, 30, 31. Vermont, 2, 6, 17. Virginia, 3, 4, 11, 14, 15, 27. Washington, 2, 3, 4, 8, 11, 12, 13, 14, 15, 17, 18, 19, 20, 22, 23, 28, 30. West Virginia, 13, 14, 15, 20, 21. Wisconsin, 2, 10, 11, 18, 19, 21, 24. Wyoming, 2, 4, 9, 10, 20, 21, 23.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	8	2.57	66	−1.3	−2.7
Middle Atlantic	12	2.77	72	−1.1	−3.3
South Atlantic	10	2.98	68	−1.4	−2.9
Florida Peninsula *	8	1.54	52	−1.4	+1.2
East Gulf	9	3.32	54	−2.8	−6.3
West Gulf	7	1.90	56	−1.5	−5.4
Ohio Valley and Tennessee	11	6.20	144	+1.9	−1.7
Lower Lake	8	3.85	151	+1.3	+2.8
Upper Lake	10	3.24	159	+1.2	0.0
North Dakota *	8	1.42	173	+0.6	+0.7
Upper Mississippi Valley	11	3.28	143	+1.0	−0.1
Missouri Valley	11	1.92	112	+0.2	−0.7
Northern Slope	7	1.09	138	+0.3	0.0
Middle Slope	6	1.06	84	−0.2	−1.1
Southern Slope *	6	0.11	11	−0.9	−1.7
Southern Plateau *	13	0.70	70	−0.3	−1.7
Middle Plateau *	8	2.22	168	+0.9	+1.5
Northern Plateau *	12	3.10	221	+1.7	+1.6
North Pacific	7	7.73	148	+2.5	+4.6
Middle Pacific	5	9.70	255	+5.9	+6.1
South Pacific	4	3.64	162	+1.4	−0.2

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Professor Stupart says:

Yarmouth and Sydney, in Nova Scotia, both report the precipitation much below the average, otherwise in all parts of the Dominion, except in a few isolated localities, it was above the average. The positive departures in the Territories and Manitoba, where the precipitation was almost entirely snow, were very pronounced; this was especially the case from the Qu'Appelle Valley to Winnipeg, and no doubt was owing to the great snowstorm which prevailed over the district during the evening and night of the 24th. The positive departures were also marked in the Ottawa Valley and over portions of the Lake region, but the precipitation was rain as well as snow.

CLEAR SKY AND CLOUDINESS.

The distribution of clear sky is graphically shown on Chart IV, and the numerical values of average daylight cloudiness, both for individual stations and by geographic districts, appear in Table I.

The cloudiness was below the average in the Florida Peninsula, west Gulf States, and southern slope region, and above the average in all other districts.

The average cloudiness for the various districts, with departures from the normal, are shown in the following table:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	6.0	+ 0.4	Missouri Valley	5.8	+ 0.2
Middle Atlantic	6.3	+ 0.8	Northern Slope	5.6	+ 0.3
South Atlantic	5.2	+ 0.5	Middle Slope	4.9	+ 0.5
Florida Peninsula	3.2	− 0.8	Southern Slope	3.3	− 0.9
East Gulf	5.4	+ 0.7	Southern Plateau	4.4	+ 1.4
West Gulf	5.0	− 0.2	Middle Plateau	6.4	+ 1.5
Ohio Valley and Tennessee	6.7	+ 0.8	Northern Plateau	7.4	+ 0.9
Lower Lake	7.0	+ 0.6	North Pacific	7.6	+ 1.0
Upper Lake	6.6	+ 0.7	Middle Pacific	7.6	+ 2.6
North Dakota	6.1	+ 0.6	South Pacific	6.0	+ 1.5
Upper Mississippi Valley	6.8	+ 1.3			

HUMIDITY.

The relative humidity was normal in New England, South Atlantic States, Florida Peninsula, and North Dakota; below the normal in the west Gulf States, Missouri Valley, and middle and southern slope and southern Plateau regions. In the remaining districts it was above the average.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	75	0	Missouri Valley	68	− 4
Middle Atlantic	73	+ 1	Northern Slope	71	+ 4
South Atlantic	75	0	Middle Slope	54	− 6
Florida Peninsula	77	0	Southern Slope	38	−17
East Gulf	78	+ 5	Southern Plateau	34	− 2
West Gulf	69	− 3	Middle Plateau	62	+ 6
Ohio Valley and Tennessee	74	+ 3	Northern Plateau	75	+ 9
Lower Lake	79	+ 3	North Pacific	82	+ 7
Upper Lake	82	+ 3	Middle Pacific	81	+ 7
North Dakota	78	0	South Pacific	74	+ 3
Upper Mississippi Valley	78	+ 5			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex	2	52	n.	New York, N. Y	16	53	nw.
Block Island, R. I	1	57	e.	North Head, Wash	4	55	s.
Do	3	57	nw.	Do	5	60	s.
Do	4	56	nw.	Do	10	85	se.
Do	9	50	nw.	Do	11	54	s.
Buffalo, N. Y	1	56	sw.	Do	12	58	se.
Do	3	60	w.	Do	17	57	s.
Do	25	52	s.	Do	18	58	s.
Carson City, Nev	1	52	sw.	Do	19	78	s.
Do	2	56	sw.	Do	20	59	w.
Do	17	60	sw.	Oklahoma, Okla	2	55	nw.
Do	18	52	sw.	Do	3	59	n.
Do	19	52	sw.	Pierre, S. Dak	20	50	se.
Cheyenne, Wyo	18	50	w.	Do	24	52	w.
Chicago, Ill	24	52	w.	Point Reyes Light, Cal	8	55	nw.
Columbus, Ohio	3	58	nw.	Do	9	64	s.
Denver, Colo	2	52	w.	Do	10	98	s.
Do	9	53	w.	Do	17	56	s.
Duluth, Minn	9	54	ne.	Do	19	63	nw.
Do	10	60	ne.	Do	20	52	w.
Do	25	52	sw.	Do	23	72	nw.
Eastport, Me	8	56	se.	Do	24	58	w.
El Paso, Tex	9	50	w.	Do	29	50	nw.
Do	21	54	w.	Do	30	58	nw.
Do	29	54	w.	Pueblo, Colo	2	50	nw.
Do	30	63	w.	Do	9	52	w.
Fort Smith, Ark	24	56	sw.	Rapid City, S. Dak	2	52	n.
Grand Rapids, Mich	24	52	sw.	Sacramento, Cal	10	65	se.
Hannibal, Mo	21	53	w.	St. Louis, Mo	3	51	n.
Do	24	51	sw.	Do	24	50	w.
Hatteras, N. C	3	51	n.	Sioux City, Iowa	2	68	nw.
Do	4	50	n.	Do	10	55	nw.
Independence, Cal	19	50	w.	Do	24	54	nw.
Lexington, Ky	3	60	nw.	Southeast Farallon, Cal	10	70	s.
Do	17	52	sw.	Do	23	60	nw.
Do	26	51	w.	Syracuse, N. Y	3	53	nw.
Lincoln, Nebr	2	51	nw.	Do	22	57	s.
Do	24	51	se.	Do	24	56	s.
Little Rock, Ark	22	53	sw.	Do	25	58	s.
Modena, Utah	8	62	sw.	Tatoosh Island, Wash	2	58	e.
Do	10	62	sw.	Do	3	52	e.
Do	11	50	sw.	Do	5	58	s.
Do	20	63	sw.	Do	10	80	s.
Do	23	60	sw.	Do	11	72	s.
Moorhead, Minn	25	51	sw.	Do	17	60	s.
Mount Tamalpais, Cal	4	51	n.	Do	18	62	sw.
Do	8	68	nw.	Do	19	56	e.
Do	10	70	sw.	Do	27	66	e.
Do	17	50	s.	Do	28	62	e.
Do	19	62	sw.	Wichita, Kans	2	50	n.
Do	23	65	nw.	Williston, N. Dak	20	50	se.
Do	24	50	sw.	Do	24	54	n.
Do	28	54	sw.	Do	25	55	nw.
Do	29	58	nw.	Winnemucca, Nev	1	54	sw.
Do	30	60	nw.	Do	10	52	sw.
New York, N. Y	3	65	nw.	Do	19	52	sw.
Do	4	51	nw.				

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 3289 thunderstorms were received during the current month as against 2149 in 1903 and 1125 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country was most numerous were: 22d, 361; 24th, 283; 3d, 245.

Reports were most numerous from: Missouri, 312; Illinois, 281; Ohio, 267.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the dates of full moon, viz: February 26 to March 5, and March 27 to April 4, inclusive.

In Canada: Thunderstorms were reported from Halifax, 3, 23; Grand Manan, 3; Yarmouth, 3; Charlottetown, 4; Ottawa, 23; Toronta, 3, 23; Port Stanley, 3, 26, 31; Saugeen, 3, 22; Parry Sound, 22, 25; New Westminster, 15; Hamilton, Bermuda, 4, 12, 15.

Auroras were reported from Minnedosa, 5; Swift Current, 4; Edmonton, 5; Prince Albert, 31; Battleford, 4, 7, 14.

DESCRIPTION OF TABLES AND CHARTS.

By Mr. W. B. STOCKMAN, District Forecaster, in charge of Division of Meteorological Records.

Table I gives, for about 137 Weather Bureau stations making two observations daily and for about 31 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,800 stations occupied by voluntary and other cooperating observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station, the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (. . . .).

Table III gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions of the wind based on these two observations only and without considering the velocity. The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I.

Table IV gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table V gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes.....	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates per hour (ins.).....	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table VI gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table VII gives the heights of rivers referred to zeros of gages; it is prepared by the Forecast Division.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are prepared by the Forecast Division. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the observations at 8 a. m. and 8 p. m., seventy-fifth meridian time. Within each circle is also given (Chart I) the highest barometric reading and (Chart II) the lowest barometric reading at or near the center at that time, and in both cases as reduced to sea level and standard gravity.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all by 0.0.

Chart IV.—Percentage of clear sky. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of clear sky, and the values thus obtained have been used in preparing Chart IV.

Chart V.—Surface temperatures; maximum, minimum, and mean of these. Lines of equal monthly mean temperature in red; lines of equal maximum temperature in black; and lines of equal minimum temperature (dotted) also in black.

Chart VI. Isobars and isotherms at 10,000 feet. The mean monthly station pressure for each station has been reduced to the 10,000-foot plane by entering Table 53, pages 789–988, Volume II, Annual Report of the Chief of the Weather Bureau, 1900–1901, with the temperature argument, t, corresponding to θ_2, and correcting the station pressure by the reduction $B_2 - B$ after applying the plateau correction, C. $\Delta\theta$. H, and the corrections for e and ΔA, the argument t being the mean monthly air temperature. This reduction is fully described in the Annual Report of the Chief of the Weather Bureau for 1900–1901, Volume II, pages 772 to 786. The reduction for obtaining B_2 may also be found by using gradients from the station pressure to the height of 10,000 feet, as set forth on pages 18 and 19 of the MONTHLY WEATHER REVIEW for January, 1902.

The isotherms on the 10,000-foot plane have been computed by using the gradients for temperature for each month and station as shown by Table 48, Chapter VIII, Volume II, Report of the Chief of the Weather Bureau, 1900–1901.

Chart VII.—Isobars and isotherms at 3500 feet. The pressure and temperature data entered on this chart are found by the method described for similar data on the 10,000 foot plane.

Chart VIII.—Isobars and isotherms at sea-level and resultant surface winds. The pressures have been reduced to sea level and standard gravity by the method described by Prof. Frank H. Bigelow on pages 13–16 of the REVIEW for January, 1902. The pressures have also been reduced to the mean of the twenty-four hours by the application of a suitable correction to the mean of the 8 a. m. and 8 p. m. readings, at stations taking two observations daily, and to the 8 a. m. or 8 p. m.

observation, respectively, at stations taking but a single observation. The diurnal corrections so applied will be found in Table 27, Volume II, Annual Report of the Chief of Weather Bureau, 1900–1901, pp. 140–164.

The isotherms on the sea-level plane have been constructed by means of the data summarized in chapter 8 of the Annual Report of the Chief of the Weather Bureau for 1900–1901, Volume II. The correction $t_0 - t$, or temperature on the sea-level plane minus the station temperature, as given by Table 48 of the above report, is added to the observed surface temperature to obtain the adopted sea-level temperature.

The resultant wind directions are computed from observations at 8 a. m. and 8 p. m. daily. The resultant durations are shown by figures attached to the arrows.

IX.—Isobars at sea-level; surface isotherms; resultant winds.

Chart X.—Hydrographs for seven principal rivers of the United States, prepared by the Forecast Division.

Chart XI.—The total snowfall. This is based on the reports from regular and voluntary observers, and shows the depth of the snowfall during the month in inches. In general, the depth is shown by lines inclosing areas of equal snowfall, but in special cases figures are also given.

Chart XII.—Depth of snow on ground at end of month.

When there is no snow the last two charts are omitted.

TABLE I.—*Climatological data for Weather Bureau stations, March, 1904.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.									Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
New England.							31.5	— 0.5										75	2.57	— 1.3								6.0		
Eastport	76	69	82	29.94	30.03	+ .10	27.8	— 0.9	47	24	35	— 2	5	20	38	26	22	82	4.95	+ 0.6	19	9,826	nw.	56	se.	8	8	5	18	6.5	18.3
Portland, Me.	103	81	117	29.94	30.07	+ .11	30.4	— 1.6	63	26	38	4	5	23	27	27	22	73	2.52	— 0.8	14	7,179	nw.	40	se.	8	12	7	12	5.5	7.5
Concord	298	70	79	29.75	30.09	+ .09	29.8	— 1.4	61	26	38	— 6	5	22	30	...	...	...	2.33	— 1.2	12	3,915	nw.	22	w.	26	10	8	13	6.0	7.9
Northfield	876	16	60	29.11	30.09	+ .09	25.4	+ 0.4	62	26	34	—12	5	16	41	22	17	71	1.84	— 1.0	11	7,615	s.	42	se.	22	5	10	16	6.8	5.6
Boston	125	115	181	29.95	30.09	+ .12	34.6	+ 0.4	70	26	42	8	5	27	33	31	25	68	2.43	— 1.7	13	8,617	nw.	39	w.	3	12	6	13	5.3	8.9
Nantucket	12	43	82	30.08	30.09	+ .11	33.8	— 1.1	51	26	39	17	5	29	17	32	29	83	2.11	— 1.4	10	11,294	nw.	45	nw.	16	5	11	15	6.9	8.4
Block Island	26	11	46	30.08	30.10	+ .12	33.7	— 1.1	53	23	39	13	5	28	18	31	27	79	1.59	— 2.4	11	14,508	nw.	57	nw.	3	9	12	10	5.3	4.1
Narragansett	.....	9	38	.....	.....	.....	34.0	+ 0.7	69	23	42	6	4	26	36	...	...	...	2.06	— 2.5	10	.....	ne.	...	.....	...	15	4	12	.....	6.5
New Haven	106	116	154	30.00	30.12	+ .13	34.4	— 0.2	66	26	42	11	5	27	31	31	26	72	3.28	— 0.9	13	7,536	nw.	33	nw.	16	12	4	15	5.5	7.3
Mid. Atlantic States.							39.5	+ 0.1										73	2.77	— 1.1								6.3		
Albany	97	102	115	30.01	30.12	+ .11	31.2	— 0.7	60	26	39	6	5	24	29	29	25	78	1.94	— 0.7	9	7,408	nw.	39	s.	25	7	9	15	6.7	11.1
Binghamton	875	79	90	29.13	30.10	+ .08	31.1	+ 0.3	62	26	39	4	5	23	35	...	...	...	2.11	— 1.0	13	5,887	nw.	31	sw.	26	5	7	19	7.2	7.7
New York	314	108	350	29.76	30.11	+ .11	36.4	— 0.5	64	26	43	17	5	30	27	33	27	69	3.44	— 0.6	14	11,519	nw.	65	nw.	3	10	5	16	6.1	4.4
Harrisburg	374	94	104	29.71	30.12	+ .09	37.0	+ 0.8	64	26	44	16	5	30	30	33	27	70	2.72	— 0.8	15	6,370	nw.	36	nw.	3	6	9	16	6.7	5.5
Philadelphia	117	116	184	30.00	30.13	+ .11	39.4	+ 0.3	68	25	46	17	5	32	27	35	30	70	3.24	0.0	12	6,681	nw.	31	s.	7	9	7	15	6.3	4.2
Scranton	805	111	119	29.23	30.12	+ .10	33.4	.....	62	26	41	10	5	26	31	30	24	70	2.10	.....	13	6,253	sw.	33	nw.	3	6	5	20	7.3	4.4
Atlantic City	52	39	48	30.06	30.12	+ .10	38.1	+ 0.5	71	26	44	19	5	32	28	34	31	78	2.67	— 1.2	14	6,706	nw.	33	nw.	3	8	11	12	6.1	2.0
Cape May	17	47	51	30.12	30.13	+ .12	38.2	— 1.3	62	26	44	16	5	33	19	35	...	...	3.18	— 1.2	14	7,073	n.	36	s.	7	5	18	8	6.0	1.1
Baltimore	123	69	117	29.98	30.11	+ .08	41.0	— 0.5	70	25	48	20	5	34	32	36	29	67	2.88	— 1.2	14	6,101	nw.	34	nw.	3	7	8	16	6.3	2.0
Washington	112	59	76	30.00	30.13	+ .09	42.2	+ 0.9	73	25	51	20	5	34	32	37	31	70	3.02	— 1.1	14	5,943	nw.	40	nw.	3	13	3	15	5.8	T.
Cape Henry	18	11	58	30.09	30.11	+ .08	45.0	— 0.2	80	26	52	28	5	38	40	...	...	...	2.23	— 2.9	16	11,015	ne.	48	n.	27	6	16	9	5.9	
Lynchburg	681	83	88	29.34	30.09	+ .04	46.4	+ 1.2	75	20	56	21	5	36	37	41	35	71	2.17	— 1.5	9	3,761	nw.	30	nw.	3	8	14	9	5.3	T.
Norfolk	91	102	111	30.02	30.12	+ .09	47.6	+ 0.7	78	26	56	28	5	40	38	43	38	76	3.67	— 0.9	15	8,075	ne.	38	se.	7	7	9	15	6.5	T.
Richmond	144	82	90	29.96	30.11	+ .07	47.5	.....	74	25	57	23	5	38	38	...	...	...	3.52	.....	10	4,489	n.	40	sw.	3	10	7	14	5.7	T.
Wytheville	2,293	40	47	27.67	30.10	+ .05	43.3	.....	74	22	54	18	4	33	40	38	34	78	2.49	.....	13	5,213	w.	28	w.	22	8	10	13	6.3	0.2
S. Atlantic States.							55.7	+ 2.2										75	2.93	— 1.4								5.2		
Asheville	2,255	53	75	27.71	30.07	+ .01	46.4	+ 0.5	75	22	56	21	4	36	38	41	37	75	4.34	+ 0.2	15	8,412	nw.	38	nw.	3	5	16	10	6.3	T.
Charlotte	773	68	76	29.25	30.10	+ .05	52.0	+ 2.1	79	20	62	27	5	42	31	45	39	68	2.60	— 2.1	13	6,170	ne.	36	sw.	3	9	9	13	5.8	
Hatteras	11	12	47	30.08	30.10	+ .06	51.4	+ 1.3	75	23	58	32	5	44	23	49	47	88	3.85	— 2.2	13	12,467	ne.	51	n.	3	13	8	10	5.4	
Raleigh	376	71	79	29.09	30.10	+ .05	51.2	+ 3.0	80	26	62	25	5	40	33	45	40	73	3.55	— 0.5	11	5,844	ne.	30	nw.	3	10	15	6	4.7	
Wilmington	78	82	90	29.99	30.08	+ .08	55.0	+ 1.1	80	23	65	29	5	45	32	50	47	80	4.33	+ 0.4	12	7,336	ne.	40	w.	15	9	17	5	4.8	
Charleston	48	14	92	30.04	30.09	+ .03	58.7	+ 1.9	77	23	66	36	5	51	24	53	48	75	1.54	— 2.4	12	9,038	e.	44	ne.	5	5	22	4	5.5	
Columbia, S. C.	351	167	175	29.70	30.09	+ .03	56.8	+ 2.6	82	23	67	30	5	46	30	49	44	68	2.63	— 1.9	13	8,727	e.	49	w.	15	9	11	11	5.8	
Augusta	180	89	97	29.88	30.08	+ .02	58.5	+ 3.0	82	26	69	33	16	48	32	51	46	71	4.04	— 1.2	11	5,732	nw.	36	w.	15	15	12	4	4.0	
Savannah	65	79	89	30.01	30.08	+ .02	61.8	+ 3.3	82	23	70	40	16	54	25	54	50	76	1.61	— 2.2	7	6,886	sw.	31	w.	11	7	18	6	5.2	
Jacksonville	43	101	129	30.01	30.06	.00	65.6	+ 3.6	86	21	74	42	4	57	25	58	54	76	1.35	— 2.1	8	7,495	sw.	36	n.	5	13	13	5	4.3	
Florida Peninsula.							72.0	+ 3.4										77	1.92	— 0.4								3.2		
Jupiter	28	10	48	30.02	30.05	.00	72.1	+ 4.3	85	14	79	56	9	66	22	66	63	78	3.06	+ 0.1	9	8,193	se.	30	ne.	29	15	15	1	3.5	
Key West	22	10	53	30.00	30.02	— .03	74.8	+ 2.1	83	22	79	65	9	70	12	68	65	75	1.94	+ 0.8	4	7,242	e.	30	nw.	28	17	12	2	3.4	
Sand Key	24	40	71	29.98	30.01	.....	74.8	.....	88	27	78	64	9	72	14	...	...	...	1.34	.....	6	11,039	e.	33	e.	25	23	6	2	2.6	
Tampa	34	60	67	30.01	30.05	— .02	69.2	+ 3.7	88	22	79	50	9	60	27	62	59	78	0.77	— 2.1	4	4,579	w.	18	nw.	14	18	10	3	3.2	
East Gulf States.							61.0	+ 3.4										76	3.32	— 2.8								5.4		
Atlanta	1,174	190	216	28.82	30.07	+ .01	53.6	+ 2.1	77	23	63	29	4	45	32	48	43	74	2.31	— 3.5	12	10,841	se.	46	nw.	3	8	9	14	5.9	
Macon	370	93	99	29.68	30.08	+ .02	59.4	.....	85	23	70	32	4	49	37	...	...	...	1.69	.....	9	5,418	nw.	30	nw.	3	7	9	15	6.2	
Pensacola	56	79	96	30.00	30.06	.00	63.0	+ 3.5	77	26	69	37	4	57	26	...	...	...	1.45	— 4.0	10	8,057	se.	42	w.	14	12	11	8	4.5	
Birmingham	700	136	143	29.29	30.06	.00	58.2	+ 1.6	84	22	68	27	4	49	34	...	...	...	3.33	— 3.0	12	8,094	s.	36	se.	6	11	9	11	5.4	
Mobile	57	88	96	29.99	30.05	— .01	63.0	+ 4.1	79	3	70	36	4	56	30	59	57	89	2.51	— 5.1	10	6,528	s.	33	n.	3	9	16	6	4.7	
Montgomery	223	100	112	29.81	30.05	— .01	51.5	+ 4.5	85	24	72	32	4	51	35	55	51	78	2.30	— 4.2	10	5,957	se.	30	nw.	13	8	12	11	5.4	
Meridian	375	84	93	29.64	30.04	— .01	60.1	+ 2.7	85	22	71	29	4	49	36	...	...	...	3.27	— 2.3	9	5,657	se.	36	nw.	13	9	17	5	5.2	
Vicksburg	247	62	74	29.72	29.98	— .06	62.5	+ 4.5	84	25	73	32	4	52	35	55	50	70	7.30	+ 0.8	10	6,857	s.	41	nw.	17	10	9	12	5.5	
New Orleans	51	88	121	29.97	30.03	— .01	66.2	+ 4.2	84	26	75	39	4	57	31	60	56	77	4.12	— 1.2	6	8,005	s.	37	n.	17	8	15	8	5.4	
West Gulf States.							63.0	+ 5.2										69	1.90	— 1.5								5.0		
Shreveport	249	77	84	29.69	29.96	— .06	63.2	+ 5.6	87	12	73	31	4	53	29	55	48	66	2.42	— 2.2	8	7,041	se.	34	s.	24	9	12	10	5.3	
Fort Smith	457	79	94	29.44	29.93	— .08	55.9	+ 5.9	86	31	67	25	4	44	48	47	40	63	3.75	+ 0.5	9	9,368	e.	56	sw.	24	3	21	7	5.5	
Little Rock	357	93	100	29.60	29.98	— .05	56.1	+ 3.9	83	21	66	28	4	46	43	49	42	65	5.31	+ 0.1	12	8,001	s.	53	sw.	22	11	10	10	5.4	
Corpus Christi	20	48	53	29.90	29.92	— .06	67.7	+ 4.9	83	12	74	38	4	61	22	62	59	80	0.18	— 1.5	6	9,639	se.	32	n.	3	8	18	5	5.2	
Fort Worth	670	106	114	29.22	29.94	— .04	62.9	.....	90	12	76	25	4	50	45	...	...	...	4.01	.....	6	11,886	s.	44	nw.	3	22	8	1	3.0	
Galveston	54	106	112	29.92	29.98	— .03	64.6	+ 2.1	77	26	70	40	4	60	24	61	59	87	0.57	— 2.3	7	10,064	s.	37	ne.	14	11	11	9	4.9	
Palestine	510	73	79	29.41	29.94	— .06	64.2	+ 6.6	88	12	74	30	4	55	30	55	49	65	0.88	— 3.1	7	8,279	s.	33	s.	24	7	16	8	5.8	
San Antonio	701	80	91	29.18	29.90	— .08	69.0	+ 7.1	96	12	81	35	4	57	38	57	48	57	0.16	— 1.9	2	6,239	se.	44	n.	3	8	17	6	4.8	
Taylor	583	55	63	29.32	29.94	— .05	66.4	.....	93	12	79	30	4	54	41	...	...	...	0.57	.....	5	10,034	s.	39	n.	3	8	13	10	5.5	
Ohio Val. and Tenn.							46.5	+ 2.4										74	6.20	+ 1.9								6.7		
Chattanooga	762	106	112	29.26	30.08	+ .02	52.2	+ 1.7	75	19	62	27	4	43	36	46	40	69	5.81	— 0.1	18	6,815	s.	44	nw.	10	9	8	14	5.7	
Knoxville	1,004	35	88	29.00	30.06	.00	51.2	+ 3.6	78	24	61	24	4	42	35	44	39	70	6.36	+ 1.0	17	6,635	sw.	42	sw.	3	11	13	7	4.8	T.
Memphis	397	146	154	29.60	30.02	— .02	54.4	+ 2.8	81	21	64	28	4	45	37	49	43	70	5.96	+ 0.1	12	9,765	s.	40	nw.	13	8	8	15	6.2	
Nashville	546	122	134	29.46	30.06	+ .01	50.5	+ 1.8	79	25	60	24	4	41	41	45	41	77	5.20	0.0	13	7,630	s.	43	nw.	22	7	11	13	6.3	
Lexington	989	75	102	28.97	30.06	+ .01	45.6	+ 3.0	77	22	55	19	4	36	45	...	...	...	4.75	— 0.2	19	10,637	se.	60	nw.	3	6	11	14	6.6	0.1
Louisville	525	114	136	29.47	30.06	+ .02	47.0	+ 2.6	79	24	56	22	4	38	42	42	38	77	6.49	+ 2.5	15	7,883	se.	44	nw.	3	5	8	18	7.2	0.2
Evansville	431	72	82	29.56	30.04	.00	46.2	.....	77	24	54	22	4	38	42	...	...	...	7.36	.....	16	6,791	ne.	41	s.	31	5	13	13	6.5	T.
Indianapolis	822	154	164	29.12	30.03	— .01	40.8	+ 1.3	73	24	49	20	4	32	43	37	35	84	10.95	+ 7.4	17	9,574	se.	47	s.	10	6	9	16	6.6	1.0
Cincinnati	628	152	160	29.36	30.06	+ .01	44.2	+ 2.0	76	24	54	20	4	34	47	39	34	72	8.17	+ 4.9	17	6,566	se.	32	w.	3	1	8	22	8.1	2.6
Columbus	824	173	190	29.16	30.05	+ .01	40.9	+ 2.8	75	22	50	18	4	32	44	36	32	79	4.93	+ 2.0	16	10,516	se.	58	nw.	3	3	9	19	7.7	0.7
Pittsburg	842	116	123	29.14	30.07	+ .03	41.2	+ 2.5	78	22	50	17	4	32	40	36	29	66	5.11	+ 2.4	16	5,324	nw.	24	nw.	22	4	9	18	7.0	0.4
Parkersburg	638	77	84	29.39	30.08	+ .03	44.0	+ 2.6	80	22	54	18	4	34	45	38	33	71	4.44	+ 0.8	17	5,786	s.	42	nw.	3	6	10	15	6.5	0.2
Elkins	1,940	41	50	27.99	30.07	+ .02	41.0	.....	80	25	52	15	17	30	47	36	31	75	4.25	.....	19	4,750	w.	29	w.	3	3	10	18	7.6	6.6
Lower Lake Region.							33.7	+ 1.4										79	3.85	+ 1.3								7.0		
Buffalo	767	178	206	29.21	30.06	+ .04	32.4	+ 2.4	60	25	39	10	4	26	37	29	25	76	3.51	+ 1.0	19	11,970	w.	60	w.	3	3	9	19	7.6	10.5
Oswego	335	76	91	29.70	30.09	+ .08	29.6	— 0.8	57	25	36	7	4	23	27	27	24	80	3.64	+ 1.0	13	10,043	s.	44	w.	3	6	7	18	6.7	11.4
Rochester	523	81	102	29.49	30.08	+ .06	31.8	+ 1.5	64	25	39	9	4	25	33	28	24	75	2.93	+ 0.1	14	8,123	w.	48	w.	3	4	8	19	7.4	10.7
Syracuse	397	97	113	29.42	30.08	+ .06	30.2	.....	62	26	37	6	4	24	36	...	...	...	2.82	.....	16	12,080	s.	58	s.	25	4	11	16	6.7	13.2
Erie	713	92	102	29.26	30.06	+ .04	34.3	+ 1.9	72	22	42	11	4	26	39	31	27	80	3.32	+ 0.6	15	9,951	s.	47	s.	22	4	7	20	6.9	3.0
Cleveland	762	190	201	29.21	30.06	+ .03	35.5	+ 2.0	73	22	44	13	4	28	44	32	28	79	4.61	+ 1.8	21	12,812	se.	48	w.	3	7	6	18	7.0	7.5
Sandusky	629	62	70	29.33	30.03	.00	36.4	+ 1.7	73	22	44	15	4	29	42	...	...	...	4.38	+ 1.8	15	6,984	sw.	48	nw.	3	10	9	12	5.9	3.4
Toledo	628	120	127	29.34	30.04	+ .01	36.3	+ 1.7	69	31	44	16	3	29	39	32	29	79	4.35	+ 2.3	16	8,000	w.	38	w.	3	7	7	17	6.9	8.4
Detroit	730	153	193	29.22	30.03	.00	33.0	+ 0.5	62	22	40	13	4	27	34	30	27	83	4.09	+ 1.8	16	9,402	w.	40	nw.	3	4	9	18	7.5	14.7
Upper Lake Region.							27.1	+ 0.4										82	3.24	+ 1.2								6.6		
Alpena	609	63	80	29.37	30.06	+ .03	24.8	+ 0.8	51	25	32	— 4	4	17	39	23	21	87	2.65	+ 0.7	16	9,425	se.	47	se.	2	8	10	13	6.1	15.4
Escanaba	612	40	48	29.36	30.05	+ .01	24.0	+ 2.2	44	22	31	— 2	4	17	24	23	21	88	2.90	+ 1.1	13	6,105	ne.	39	nw.	3	11	8	12	5.8	15.7
Grand Rapids	707	127	165	29.23	30.02	— .01	32.2	+ 0.2	59	24	39	10	3	26	34	29	27	85	4.39	+ 2.0	17	8,709	e.	52	sw.	24	4	6	21	7.8	20.0
Houghton	668	66	74	29.30	30.03	+ .01	21.0	.....	48	25	30	—11	4	12	34	...	...	...	3.91	.....	13	6,427	e.	31	se.	10	17	8	6	4.2	35.4
Marquette	734	76	116	29.23	30.06	+ .02	23.2	0.0	46	24	30	0	3	16	30	21	18	82	3.62	+ 1.8	11	8,176	nw.	42	se.	21	4	11	16	6.9	36.0
Port Huron	638	70	120	29.34	30.06	+ .03	30.8	+ 1.7	59	22	38	9	4	24	33	28	25	80	2.62	0.0	13	9,616	nw.	48	nw.	3	6	8	17	7.2	9.7
Sault Ste. Marie	614	40	61	29.33	30.03	.00	21.8	— 0.1	47	25	30	—18	4	14	34	20	16	80	1.46	+ 0.2	13	8,059	nw.	39	nw.	8	10	6	15	6.1	10.9
Chicago	823	241	274	29.11	30.02	— .01	35.2	+ 1.1	65	24	42	13	3	28	37	32	29	82	4.57	+ 2.1	17	12,761	nw.	52	w.	24	3	11	17	7.5	14.3
Milwaukee	681	124	142	29.26	30.02	— .01	32.6	+ 2.1	59	24	39	10	3	26	28	29	26	82	5.46	+ 3.0	16	8,980	w.	43	sw.	24	6	6	19	7.1	29.3
Green Bay	617	49	86	29.34	30.03	— .01	27.5	+ 0.8	50	25	34	0	4	21	27	25	21	77	3.05	+ 0.9	16	8,608	ne.	40	ne.	14	5	10	16	7.2	8.0
Duluth	1,133	11	47	28.77	30.04	— .02	18.7	— 4.3	38	7	26	—12	3	12	28	17	14	82	1.67	0.0	12	12,714	ne.	60	ne.	10	3	15	13	6.9	13.4

TABLE I.—*Climatological data for Weather Bureau stations, March, 1904*—Continued.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.					Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
North Dakota.							**17.6**	**— 4.5**											**78**	**1.52**	**+ 0.7**								**6.1**	
Moorhead	935	54	60	28.97	30.02	— .06	21.0	+ 0.8	46	24	30	—11	3	12	31		20	18	90	1.90	+ 1.0	12	8,496	nw.	51	sw.	25	5	7	19	7.4	12.2
Bismarck	1,674	16	29	28.16	30.01	— .05	19.4	— 3.2	45	6	28	—10	3	10	33		17	10	66	1.09	0.0	11	9,781	nw.	48	n.	25	11	7	13	5.7	10.9
Williston	1,875	14	44	27.92	30.00	— .04	12.4	—11.1	42	6	22	—16	13	2	41		10	7	79	1.57	+ 1.1	13	10,465	e.	55	nw.	25	11	12	8	5.2	16.0
Upper Miss. Valley.							**37.0**	**+ 1.2**											**78**	**3.28**	**+ 1.0**								**6.8**	
Minneapolis		99	208				27.7	+ 0.3	53	23	34	— 4	3	21	27					1.64	+ 0.1	10	9,709	nw.	48	n.	2	3	6	22		5.8
St. Paul	837	102	122	29.06	30.00	— .05	28.6	+ 1.1	53	23	35	— 2	3	22	27		27	23	80	1.47	0.0	11	6,487	nw.	31	w.	25	2	9	20	7.5	7.4
La Crosse	714	71	87	29.23	30.02	— .02	31.4	+ 0.6	56	23	38	4	3	25	29					1.70	+ 0.1	12	6,110	se.	37	n.	2	5	9	17	7.1	5.3
Davenport	606	71	79	29.32	29.97	— .06	36.0	+ 1.1	62	24	44	13	3	29	30		32	29	78	2.70	+ 0.5	11	6,879	nw.	38	s.	24	4	8	19	7.5	7.9
Des Moines	861	84	99	29.06	30.00	— .04	36.2	+ 1.5	63	2	44	8	3	28	46		32	28	77	1.20	— 0.3	10	7,704	nw.	41	nw.	2	4	13	14	7.1	4.5
Dubuque	698	100	117	29.24	30.01	— .03	33.8	+ 0.9	56	4	41	8	3	27	27		30	27	80	2.86	+ 0.6	12	6,370	nw.	34	nw.	3	11	7	13	5.8	8.0
Keokuk	614	63	78	29.30	29.98	— .05	38.6	+ 1.0	74	21	46	14	3	31	36		34	30	78	3.46	+ 1.3	13	6,882	nw.	36	w.	24	7	10	14	6.5	4.7
Cairo	356	87	93	29.63	30.02	— .02	49.1	+ 2.3	78	21	58	24	4	40	45		44	40	75	4.60	+ 0.8	12	8,911	s.	46	n.	3	2	17	12	7.0	T.
Springfield, Ill.	644	82	93	29.30	30.00	— .03	39.8	+ 0.6	73	31	48	19	3	32	30		36	33	81	4.73	+ 2.0	15	8,907	nw.	34	nw.	3	4	8	19	7.7	2.1
Hannibal	534	75	109	29.41	30.00	— .02	41.2	+ 1.7	80	21	50	16	3	32	39					3.82	+ 1.1	12	8,204	nw.	53	w.	21	9	10	12	5.5	3.4
St. Louis	567	208	217	29.37	29.99	— .04	44.9	+ 1.8	79	31	54	22	3	36	46		40	36	76	7.87	+ 4.4	12	9,956	se.	51	n.	3	6	10	15	6.5	T.
Missouri Valley.							**39.5**	**+ 3.1**											**68**	**1.92**	**+ 0.2**								**5.8**	
Columbia, Mo	784	11	84	29.10	29.95	— .08	43.8	+ 2.4	83	21	55	15	4	33	46					3.69	+ 0.7	12	8,495	se.	47	sw.	24	8	12	11	5.9	0.2
Kansas City	963	78	95	28.93	29.99	— .03	43.6	+ 3.1	78	21	53	15	3	34	54		38	32	71	5.51	+ 3.3	9	7,161	nw.	44	nw.	3	12	7	12	5.4	1.8
Springfield, Mo	1,324	98	104	28.53	29.95	— .07	47.4	+ 3.9	82	21	58	18	3	36	40		41	36	71	4.43	+ 0.7	11	11,184	se.	45	nw.	3	15	8	8	4.6	T.
Topeka		85	89				43.4	+ 2.4	80	2	55	13	3	32	62					2.62	+ 0.5	6	8,498	n.	44	s.	9	5	19	7	5.8	3.9
Lincoln	1,189	75	84	28.66	29.96	— .06	38.9	+ 1.0	79	2	50	8	3	28	67		32	24	65	0.97	— 0.4	5	9,515	se.	51	se.	24	8	10	13	5.8	3.8
Omaha	1,105	115	121	28.76	29.97	— .07	38.2	+ 2.7	74	2	48	6	3	28	62		32	25	66	1.32	— 0.2	9	8,049	n.	46	nw.	2	6	10	15	6.5	4.8
Valentine	2,598	47	54	27.18	29.94	— .09	36.4	+ 5.2	69	9	50	2	3	22	54		29	21	60	0.64	— 0.8	3	9,639	nw.	48	nw.	9	13	8	10	4.9	3.6
Sioux City	1,135	96	164	28.72	29.97	— .08	35.0	+ 3.4	67	9	45	2	3	25	55					0.50	— 0.7	6	11,257	nw.	68	nw.	2	4	10	17	7.2	1.4
Pierre	1,572	43	50	28.26	29.97	— .08	32.6	+ 3.2	64	23	44	0	3	22	36		27	20	67	0.33	— 0.5	5	8,293	e.	52	w.	24	5	16	10	6.3	2.6
Huron	1,306	56	67	28.54	29.98	— .08	29.9	+ 2.3	65	23	40	— 7	3	20	45		26	21	75	0.24	— 0.6	10	11,124	nw.	49	se.	20	5	12	14	6.6	0.8
Yankton	1,233	42	49	28.63	29.98	— .07	34.2	+ 4.2	67	9	46	0	3	23	60					0.92	— 0.2	4	7,028	e.	45	s.	23	11	14	6	4.9	3.8
Northern Slope.							**30.2**	**— 1.6**											**71**	**1.09**	**+ 0.3**								**5.6**	
Havre	2,505	11	44	27.25	30.00	.00	16.5	—12.5	48	5	26	—18	26	7	38		15	13	88	0.86	+ 0.3	9	7,052	ne.	34	nw.	8	14	10	7	4.9	8.6
Miles City	2,371	42	50	27.34	29.93	— .09	23.3	— 8.1	54	8	33	—12	3	14	36		20	19	91	2.46	+ 1.9	8	5,101	n.	40	nw.	20	8	15	8	5.5	21.2
Helena	4,110	88	94	25.63	29.92	— .09	28.1	— 4.5	54	7	37	— 9	25	19	36		24	17	65	1.37	+ 0.8	15	4,880	sw.	30	w.	15	6	10	15	6.5	17.3
Kalispell	2,965	45	51	26.75	29.87	— .12	29.4	.....	52	7	38	— 5	25	21	31		26	22	75	1.94	.....	21	4,259	w.	26	sw.	15	12	9	10	5.2	13.3
Rapid City	3,234	46	50	26.45	29.90	— .11	33.8	+ 2.6	67	8	46	1	26	21	52		28	23	74	0.40	— 0.7	1	6,109	nw.	52	n.	2	11	9	11	4.9	T.
Cheyenne	6,088	56	64	23.83	29.87	— .09	35.2	+ 2.4	62	18	48	— 1	26	22	50		27	16	48	0.45	— 0.2	4	9,816	nw.	50	w.	18	8	10	13	5.9	4.5
Lander	5,372	26	36	24.45	29.86	— .13	33.8	+ 3.3	61	8	47	4	25	20	35		28	22	66	1.57	0.0	8	4,178	sw.	38	sw.	1	4	21	6	5.5	15.3
Yellowstone Park	6,200	11	47	23.66	29.89	— .13	25.2	.....	44	7	34	—16	25	16	35		22	18	72	2.98	.....	19	7,076	s.	39	nw.	2	1	17	13	7.1	25.6
North Platte	2,821	43	52	26.96	29.93	— .07	40.4	+ 5.3	77	18	57	0	3	24	61		32	25	64	0.52	— 0.2	4	7,986	nw.	48	nw.	24	7	18	6	5.2	0.6
Middle Slope.							**47.1**	**+ 5.0**											**54**	**1.06**	**— 0.2**								**4.9**	
Denver	5,291	79	151	24.55	29.83	— .12	42.5	+ 3.7	71	8	56	4	26	29	45		34	27	59	0.94	0.0	9	7,360	s.	53	w.	9	7	18	6	5.5	10.3
Pueblo	4,685	80	86	25.13	29.83	— .09	44.4	+ 4.0	78	2	60	12	26	28	52		33	19	45	0.52	0.0	4	6,614	nw.	52	w.	9	10	17	4	4.7	1.0
Concordia	1,398	42	47	28.45	29.95	— .06	43.4	+ 4.4	81	2	56	9	3	31	53		36	28	63	0.36	— 1.2	4	7,091	s.	36	s.	9	11	15	5	4.9	0.2
Dodge	2,509	44	54	27.27	29.89	— .08	47.2	+ 5.6	86	2	63	6	3	32	66		36	23	49	0.04	— 0.9	1	9,690	se.	49	se.	23	11	6	14	5.7	T.
Wichita	1,358	78	86	28.48	29.93	— .06	48.9	+ 5.4	80	2	62	12	3	36	57		41	33	60	4.23	+ 2.4	5	8,402	n.	50	n.	2	11	18	2	4.3	
Oklahoma	1,214	79	86	28.59	29.87	— .11	56.0	+ 6.9	88	2	70	19	3	42	50		44	32	48	0.26	— 1.8	3	11,830	s.	59	n.	3	12	16	3	4.4	
Southern Slope.							**57.4**	**+ 8.0**											**33**	**T.**	**— 0.8**								**3.3**	
Abilene	1,738	45	54	28.09	29.88	— .08	63.0	+ 8.9	92	30	77	26	4	49	40		48	36	46	0.00	— 1.2	0	9,142	s.	42	n.	3	13	11	7	4.5	
Amarillo	3,676	10	49	26.12	29.84	— .11	51.9	+ 7.0	84	2	67	15	3	37	50		37	17	31	T.	— 0.4	0	12,235	sw.	52	n.	2	24	7	0	2.1	
Southern Plateau.							**53.7**	**+ 2.5**											**34**	**0.51**	**— 0.4**								**4.4**	
El Paso	3,762	10	110	26.10	29.83	— .05	60.5	+ 4.7	84	2	76	34	4	45	45		41	14	19	0.00	— 0.4	0	10,480	w.	63	w.	30	10	21	0	4.0	
Santa Fe	7,013	47	50	23.14	29.86	— .03	42.6	+ 3.1	66	2	54	16	13	31	33		31	14	34	0.32	— 0.3	7	5,973	sw.	33	sw.	24	16	11	4	3.5	0.6
Flagstaff	6,907	12	25	23.25	29.84	— .07	39.0	+ 1.8	65	7	52	0	24	26	46		30	19	51	1.39	— 1.5	7	7,962	sw.	40	sw.	23	6	14	11	5.7	13.1
Phoenix	1,108	50	56	28.73	29.88	— .03	62.9	+ 2.0	88	3	77	38	13	49	40		46	26	28	0.12	— 0.5	1	3,812	e.	28	w.	23	10	14	7	5.0	
Yuma	141	16	46	29.74	29.90	— .04	66.2	+ 2.2	92	7	80	42	22	52	44		50	35	36	0.28	0.0	1	5,569	w.	31	nw.	20	19	9	3	2.5	
Independence	3,910	51	58	25.88	29.86	— .08	50.9	+ 1.2	75	2	61	28	25	40	31		39	22	35	0.95	+ 0.5	6	6,890	nw.	50	w.	19	10	5	16	6.0	T.
Middle Plateau.							**41.2**	**— 0.4**											**62**	**2.02**	**+ 0.8**								**6.4**	
Carson City	4,720	82	92	25.15	29.89	— .09	40.4	— 0.8	62	6	49	19	21	32	31		36	31	70	1.99	+ 0.7	13	9,351	sw.	60	sw.	17	5	9	17	6.9	6.6
Winnemucca	4,344	59	70	25.48	29.89	— .12	38.8	— 1.9	61	7	47	20	26	30	31		34	28	67	1.47	+ 0.6	20	9,689	sw.	54	sw.	1	3	2	26	8.7	6.5
Modena	5,479	10	43	24.48	29.84	— .12	40.9	.....	67	2	54	11	24	28	36		33	24	56	0.98	.....	10	9,963	sw.	63	sw.	20	13	14	4	4.5	1.5
Salt Lake City	4,366	105	110	25.50	29.90	— .08	40.8	— 0.8	63	6	50	19	12	32	32		34	28	64	3.99	+ 2.0	18	5,452	se.	48	w.	23	9	8	14	6.1	17.2
Grand Junction	4,608	43	51	25.25	29.83	— .11	44.9	+ 2.1	73	8	57	18	26	32	39		36	26	51	0.64	— 0.2	6	5,152	nw.	33	s.	11	5	16	10	5.8	1.2
Northern Plateau.							**39.2**	**— 1.3**											**75**	**3.71**	**+ 2.1**								**7.4**	
Baker City	3,471	53	59	26.27	29.88	— .15	35.2	— 0.3	55	7	41	14	24	29	20		31	26	71	1.85	0.0	20	5,677	se.	36	sw.	20	3	4	24	8.2	7.9
Boise	2,739	61	68	27.05	29.93	— .10	41.6	— 2.3	61	7	49	26	24	34	23		39	36	81	5.39	+ 3.6	22	5,343	se.	37	sw.	19	3	5	23	8.2	10.2
Lewiston	757	52	61	29.05	29.87	— .16	43.0	— 0.8	63	7	50	26	26	36	24					4.05	+ 3.3	19	3,538	e.	36	w.	10	7	7	17	6.9	5.4
Pocatello	4,482	46	54	25.34	29.91	— .10	36.9	+ 2.6	56	7	44	20	22	29	28		32	26	64	4.00	+ 1.8	21	8,557	e.	46	se.	10	1	13	17	7.3	11.8
Spokane	1,929	101	110	27.79	29.88	— .13	35.8	— 3.9	58	7	42	16	25	30	26		32	28	76	2.81	+ 1.4	20	6,136	s.	39	sw.	20	4	5	22	8.0	10.0
Walla Walla	1,000	65	71	28.79	29.87	— .15	42.6	— 2.9	67	7	50	25	26	36	26		39	36	81	4.17	+ 2.3	20	5,526	s.	36	se.	10	8	9	14	6.1	4.8
N. Pac. Coast Reg.							**42.0**	**— 3.0**											**82**	**7.73**	**+ 2.5**								**7.6**	
North Head	211	11	56	29.57	29.80	— .21	42.2	— 3.2	57	31	47	31	2	37	17		41	39	89	7.86	+ 1.4	28	16,598	e.	85	se.	10	6	4	21	7.5	1.8
Port Crescent	259	12	29	29.50	29.78	— .20	38.4	— 3.2	51	10	43	26	2	33	15					7.46	+ 2.8	24	4,709	ne.	27	ne.	23	3	13	15	7.0	1.3
Seattle	123	114	151	29.70	29.83	— .16	42.6	— 2.2	58	7	48	31	24	37	22		40	36	80	6.22	+ 3.1	24	6,878	se.	36	se.	11	3	11	17	7.1	8.4
Tacoma	213	113	120	29.58	29.81	— .19	41.6	— 2.8	58	7	47	29	24	36	23					6.08	+ 2.2	25	6,215	sw.	37	sw.	11	5	13	13	6.6	4.4
Tatoosh Island	86	7	57	29.65	29.75	— .21	41.0	— 3.3	50	31	45	32	1	37	12		39	36	84	9.42	+ 0.3	26	17,060	e.	80	s.	10	2	11	18	7.6	5.0
Portland, Oreg.	154	68	96	29.68	29.84	— .18	43.4	— 3.8	61	31	49	30	2	38	27		40	36	78	8.73	+ 3.2	27	5,644	se.	32	sw.	20	1	4	26	8.7	T.
Roseburg	518	56	67	29.32	29.89	— .15	45.0	— 2.7	64	31	51	31	23	39	29		41	38	78	8.36	+ 4.8	24	3,362	s.	42	w.	19	1	6	24	8.5	1.2
Mid. Pac. Coast Reg.							**50.3**	**— 2.0**											**81**	**9.70**	**+ 5.9**								**7.6**	
Eureka	62	62	80	29.90	29.97	— .09	48.2	— 0.5	64	6	53	36	23	43	19		45	42	81	19.05	+12.9	26	7,165	se.	48	se.	10	3	3	25	8.4	
Mount Tamalpais	2,375	11	18	27.51	30.01	— .05	43.6	.....	64	6	49	31	23	39	21		41	38	86	9.94	.....	24	14,793	sw.	70	sw.	10	3	11	17	7.4	3.3
Red Bluff	332	50	56	29.61	29.97	— .07	50.1	— 4.4	71	31	56	32	21	44	26		46	42	77	8.33	+ 5.1	19	6,384	se.	38	se.	10	2	11	18	7.4	
Sacramento	69	106	117	29.93	30.00	— .03	51.9	— 2.8	68	7	57	36	25	46	20		48	44	78	5.43	+ 2.5	19	7,962	se.	65	se.	10	3	13	15	7.0	
San Francisco	155	161	167	29.88	30.05	— .01	51.8	— 1.8	66	31	57	40	20	47	19		48	45	81	6.01	+ 2.9	23	7,126	w.	48	se.	10	5	10	16	6.8	
Point Reyes Light	490	7	50	.....	.....	.....	49.6	— 0.5	62	7	54	37	20	45	14		.....	.....	.....	7.08	+ 2.6	25	17,286	nw.	98	s.	10	4	6	21	8.0	
Southeast Farallon	30	9	17	29.99	30.02	.....	51.6	.....	60	7	54	42	23	49	10		.....	.....	.....	6.30	.....	24	11,940	nw.	70	s.	10	2	9	20	8.1	
S. Pac. Coast Reg.							**55.6**	**+ 0.1**											**74**	**3.64**	**+ 1.4**								**6.0**	
Fresno	330	67	70	29.66	30.02	+ .01	54.4	— 0.1	75	19	63	35	25	46	25	50	46	76		2.75	+ 1.4	13	4,315	nw.	38	nw.	8	8	6	17	6.5	
Los Angeles	338	116	123	29.64	30.01	— .01	57.2	+ 0.9	89	7	67	39	25	48	29	50	45	72		4.50	+ 1.5	9	4,158	w.	33	sw.	8	4	14	13	6.4	
San Diego	87	94	102	29.91	30.00	— .02	56.5	+ 0.5	74	7	63	44	22	50	21	52	48	77		2.17	+ 0.6	10	5,041	nw.	27	nw.	23	12	5	14	5.3	
San Luis Obispo	201	47	54	29.83	30.05	— .01	54.4	— 0.8	79	7	63	36	24	46	25	49	44	73		5.13	+ 2.1	13	4,751	n.	32	se.	10	8	13	10	5.6	
West Indies.																															
Basseterre	29	41	54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bridgetown	30	57	65	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cienfuegos	52	62	67	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Grand Turk	11	6	20	29.98	29.99	— .03	75.7	.....	86	*	82	62	18	69	19	.....	.....	.....	.....	4.70	.....	19	.....	e.	.....	.....	.....	17	10	4	4.3	
Hamilton	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Havana	286	41	62	29.95	30.01	.00	73.4	+ 0.2	86	29	81	57	10	66	23	.....	.....	.....	.....	1.03	— 0.8	3	8,108	e.	38	ne.	16	25	5	1	1.5	
Puerto Principe	352	55	90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Juan	82	48	52	29.89	29.98	— .04	75.1	— 0.9	83	29	81	66	2	70	15	70	67	77		3.35	+ 1.0	18	8,588	e.	32	e.	25	9	14	8	5.5	

* More than one date.

TABLE II.—*Climatological record of voluntary and other cooperating observers, March, 1904.*

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Anniston[a]	84	29	55.8	3.54	
Ashville	84	27	55.6	4.03	
Benton				2.72	
Bermuda				2.83	
Boligee	87	30	61.0	2.71	
Bridgeport				6.81	
Burkeville				2.30	
Calera				2.26	
Camphill	87	29	58.4	2.05	
Citronelle	82	32	64.2	3.17	
Clanton	89	30	59.4	1.05	
Cordova				5.00	
Daphne	84	34	64.3	2.09	
Decatur	84	26	54.0	7.60	
Demopolis				3.78	
Dothan	89	35	63.9	3.61	
Eufaula	83	34	59.4	2.73	
Evergreen	84	32	61.4	4.33	
Flomaton	87[f]	33[e]	63.2[f]	3.95	
Florence *a*				5.64	
Florence *b*	83	29	55.9	5.95	
Fort Deposit	85	30	60.6	1.88	
Gadsden	86	28	55.8	4.06	
Goodwater	85	28	57.8	1.82	
Greensboro	85	29	60.7	2.82	
Greenville				2.29	
Highland Home	86	30	61.4	4.20	
Letohatchie				1.97	
Livingston	85	30	57.8	2.92	
Lock No. 4	84	29	56.6	2.42	
Madison Station	85	25	56.8	8.50	
Maplegrove	85	27	53.4	4.08	
Marion	86	29	60.3	2.35	
Milstead				1.58	
Newburg	88	28	61.0	2.69	
Notasulga				2.66	
Oneonto	80	23	53.5	6.70	
Opelika	86	30	58.3	3.01	
Ozark	87	32	62.3	5.19	
Prattville	86	30	59.8	1.55	
Pushmataha	83	29	60.6	3.16	
Riverton	81	24	55.4	7.09	
Scottsboro	81	27	53.7	5.22	
Selma	86	38	63.0	1.74	
Spring Hill	80	36	63.8		
Talladega	86	28	58.2	1.81	
Tallassee				2.67	
Thomasville	85	29	60.2	2.72	
Tuscaloosa	87	29	57.9	3.71	
Tuscumbia	82	26	53.9	7.42	
Tuskegee	86	31	61.6	2.75	
Union Springs	85	31	60.8	3.14	
Uniontown	87	26	60.6	2.25	
Valleyhead	82	24	52.5	6.09	
Verbena				1.53	
Wetumpka	88	30	61.6	2.18	
Alaska.					
Sitka	51	7	32.2	3.04	11.0
Arizona.					
Agua Caliente	92	36	66.6	0.00	
Allaire Ranch				0.18	
Arizona Canal Co's Dam	90	38	64.5	0.15	
Aztec	96	30	67.8	0.01	
Benson	86	28	58.4	0.25	
Bisbee	81	34	57.6	T.	
Blue	75	12	47.5	0.30	
Bowie	84	30	58.6	0.27	
Buckeye	92	44	65.8	0.30	
Casagrande	93			0.12	
Champie Camp	105	26	61.3	0.04	
Cochise[e1]	81	35	59.0	0.00	
Congress	82	38	60.1	0.19	
Douglas	88	27	58.0	T.	
Dragoon[e1]	81	35	50.5	0.00	
Dudleyville	88	29	60.7	0.13	
Duncan	83	18	53.2	0.25	
Fort Apache	78	19	48.7	0.65	
Fort Defiance	61	5	37.0	0.75	7.5
Fort Grant	85	32	56.6	0.14	
Fort Huachuca	83	31	59.8	0.14	
Fort Monave	91	36	64.4	0.12	
Gillabend	85	56	71.1	0.00	
Grand Canyon				1.00	12.0
Greaterville	80	26	54.4	0.18	
Holbrook	78	15	48.4	0.28	0.6
Jerome	75	32	53.2	0.50	
Kingman	80	16	53.4	0.55	
Maricopa	88	28	62.0	0.10	
Mesa	90	33	62.0	0.27	
Mesa (near)	89	30	59.9	0.20	
Mohawk Summit[e1]	94	49	68.2	0.00	
Natural Bridge				1.22	
Nogales	87	29	57.2	0.02	
Oracle	77	35	57.2	0.38	
Oro				0.13	
Parker	99	33	64.5	0.04	
Phoenix	89	32	61.7	0.18	
Pinal Ranch				0.67	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Arizona—Cont'd.	°	°	°	*Ins.*	*Ins.*
Prescott	72	10	46.7	1.00	4.0
St. Johns	76	15	47.4	0.10	1.0
San Carlos	88	27	58.9	0.16	
Sentinel[e1]	90	48	61.6	0.10	
Signal				0.20	
Superstition				0.15	
Taylor	78	12	48.2	T.	
Thatcher	85	27	57.6	T.	
Tonto	83	36	59.7	0.42	
Tuba	74	21[b]	47.2[e]	0.16	
Tucson	88	30	60.2	0.06	
Vail[e5]	84	46	65.0	0.06	
Walnutgrove				0.00	
Wilcox	82	23	53.0	0.21	
Williams	76	9	44.2	0.90	10.0
Yarnell				0.45	
Young	81	19	50.4	0.51	
Arkansas.					
Alco	82	20	52.5	5.85	
Amity	90	21	58.0	5.03	
Arkadelphia	84	26	58.6	5.47	
Arkansas City				5.52	
Batesville	83	21	52.8	4.10	
Beebranch				5.55	
Blanchard	85	25	60.5	6.93	
Brinkley	81	15	53.1	6.95	
Camden *a*				5.98	
Camden *b*	87	30	60.2	6.32	
Conway	85	23	56.0	4.78	
Corning	82	22	50.8	6.08	
Dallas	84	22	58.2	4.14	
Dardanelle				5.24	
Des Arc	85	28	57.0	7.58	
Dodd City	86	22	52.4	4.80	
Dutton	80	13	50.2	5.97	
Elon	86[a]	25[a]	59.8[a]	5.48	
Eureka Springs	85	17	52.1	5.14	
Fayetteville	85	15	51.8	5.20	
Forrest City	80	26	55.0		
Fulton				6.38	
Hardy	85	18	52.3	5.86	
Heber	85	18	55.1	6.81	
Helena *a*				6.68	
Helena *b*	82	29	55.8	6.39	
Hope	86	28	60.7	7.65	
Howe	88	29	60.8	4.51	
Jonesboro	89	21	56.1	4.56	
Lacrosse	85	19	50.2		
Lake Village	85	32	59.1	6.53	
Lonoke	85	26	56.2	6.18	
Lutherville	84	26	52.8	5.85	
Malvern	86	25	56.0	5.30	
Marvell	83	28	57.7	6.87	
Mossville	78	16	50.6	6.38	
Mount Nebo	79	22	52.4	5.29	
New Gascony				6.00	
New Lewisville	89	29[e]	58.8	4.24	
Newport *a*				5.01	
Newport *b*	84	25	52.6	5.04	
Oregon	85	15	50.0	3.70	
Ozark	90	24	56.1	6.41	
Paragould	83	24	54.0	6.60	
Perry	88	24	57.0	3.99	
Pinebluff	86	29	56.6	7.30	
Pocahontas	83	18	51.4	5.20	
Pond	85	12	52.6	1.88	
Prescott	85	29	57.7	7.28	
Princeton	85	26	58.6	7.15	
Russellville	83[e]	22[e]	51.8[e]	5.21	
Silversprings	84	14	53.1	3.58	T.
Spielerville	87	27	56.8	4.18	
Stuttgart	83	24	57.2	7.92	
Texarkana	87	26	63.1	4.88	
Warren	84	26	57.1	7.67	
Wiggs	81	25	56.6	5.01	
Witts Springs	75	16	49.0	8.47	
California.					
Angiola	78	38	59.0	1.75	
Azusa	92	35	56.9	6.19	
Bagdad	87	42	63.8	0.00	
Bakersfield	80	32	55.0	0.92	
Barstow	87	40	61.2	0.10	
Bear Valley				27.99	100.0
Berkeley	65	34	50.0	11.04	
Bishop	78	21	47.8	2.39	
Boca[e1]	52	2	32.4	3.86	28.5
Bodie	57	−12	28.9	4.07	39.0
Bowman				39.51	113.0
Branscomb	67	24	43.6	27.85	13.5
Brush Creek	62	28	44.6	25.01	4.0
Butte Valley				22.10	86.0
Caliente[e1]	75	34	48.8	1.60	
Campbell	73	32	52.2	3.55	
Campo				4.19	
Cedarville	59	13	35.8	4.61	24.5
Chico	68	31	52.7	9.33	
Chino	86	39	56.8	4.32	
Cisco[e1]	44	18	31.4	26.87	165.0

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Claremont	89	34	55.4	5.79	
Cloverdale	73	30	49.6	16.57	
Colusa	68	34	51.2	5.67	
Corning[e5]	70	38	53.2	7.30	
Coronado				2.21	
Crescent City	64	33	45.6	29.84	
Cuyamaca	68	20	41.6	12.75	1.0
Delano[e1]	74	35	54.9	1.30	
Delta[e1]	68	26	44.7	23.93	6.0
Dobbins	72	34	52.2	13.65	
Drytown	72	34	51.5	7.70	
Dunnigan[e1]	70	38	53.0	8.87	
Durham	69	30	51.0	10.32	
Elcajon	91	32	57.2	2.66	
Electra				9.50	
Elmdale	80	32	54.4	2.17	
Elsinore	94	27	55.8	4.14	
Escondido	83	26	52.2	3.79	
Folsom City				7.70	
Fort Bragg				12.41	
Fort Ross	63	34	49.8	26.27	
Foster				5.98	
Fouts Springs				12.73	5.0
Georgetown	65	28	44.6	21.17	18.0
Gilroy (near)	75	31	53.2	4.14	
Greenville	58	11	40.2	15.53	41.5
Hanford	95	23	47.9	2.05	
Healdsburg	75	30	51.0	19.88	
Hollister	76	30	53.4	3.70	
Idylwild	75	16	45.0	4.59	
Imperial	96	36	68.8	T.	
Iowa Hill[e1]	62	33	44.8	16.97	12.8
Irvine				3.15	
Isabella	80	30	55.2	2.67	
Jamestown	73	28	50.2	8.18	
Jolon				4.32	
Kennedy Gold Mine				9.22	
Kentfield				22.37	
Kernville				2.60	
King City	76	30	54.6	2.44	
Lakeport (near)	60	33	47.0	7.74	T.
Lamesa				3.43	
Laporte	54	13	33.8	31.66	115.7
Legrande	72	30	49.0	2.90	
Lemoncove	80	32	55.6	2.75	
Lick Observatory	55	22	38.7	8.06	9.8
Livermore	73	31	53.0	3.71	
Lodi	76	32	53.6	4.85	
Los Gatos	73	35	52.2	8.54	
Magnolia	68	26	45.2	30.13	7.0
Mammoth	90	40	65.8	0.00	
Marysville	70	37	52.5	7.77	
Merced	76	38	56.9	2.34	
Mercury				21.59	
Mills College				9.19	
Milo				4.51	
Milton (near)	71	36	52.8	5.30	
Modesto[e1]	75	40	54.0	2.15	
Mohave	82	30	55.0	1.20	
Mokelumne Hill				9.52	2.0
Montague	60	18	39.8	4.43	T.
Monterio	78	28	49.0	5.82	
Monterey[e1]	60	33	49.5	3.96	
Mount St. Helena				26.14	1.5
Napa	63	30	46.8	7.93	
Needles	93	44	69.8	0.00	
Nellie				12.37	2.5
Nevada City	63	27	43.6	18.64	24.0
Newcastle	85	38	52.2	11.61	
Newman	75	32	54.7	2.33	
Niles	72	34	53.2	4.70	
Nimshew	62	23	45.2	29.09	12.0
Nordhoff				6.13	
North Bloomfield	66	23	41.8	21.89	10.0
Oakland	67	37	53.4	9.56	
Ontario (near)	89	34	56.9	5.16	
Orland	77	28	51.0	6.36	
Orleans	74	32	49.0	20.49	2.0
Oroville (near)	68	33	52.0	10.86	
Palermo	70	31	50.6	9.35	
Peachland[e5]	68	33	51.2	19.82	
Pilot Creek				25.45	71.5
Pine Crest	90	37	55.6	5.59	
Pino Grande	58	23	39.6	25.38	74.2
Placerville	68	30	48.2	13.48	
Point Lobos	62	40	51.6	5.31	
Porterville	79	31	55.0	1.85	
Poway				3.74	
Quincy	59	20	41.0	10.83	35.0
Redding	68	30	48.4	15.89	T.
Redlands	90	35	58.4	4.55	
Reedley	76	40	57.0	2.27	
Represa	74	40	53.2	8.55	
Riovista	74	33	52.3	6.93	
Riverside	91	32	55.8	3.22	
Rohnerville				16.58	
Rosewood	69	27	47.4	8.78	
Sacramento	74	34	54.3	6.53	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Salinas	76	31	54.1	2.94	
Salton	98	40	66.0	0.25	
San Bernardino	91	33	56.2	5.34	
San Jose	75	37	56.1	2.73	
San Leandro	70	32	51.9	8.33	
San Mateo*[1]	68	40	54.3	7.32	
San Miguel*[1]	79	34	53.6	2.55	
San Miguel Island				3.29	
San Rafael	69	35	52.0	15.99	
Santa Barbara	92	36	56.0	4.40	
Santa Clara College	75	32	53.5	3.92	
Santa Cruz	75	31	52.0	8.35	
Santa Maria	78	36	56.2	3.06	
Santa Monica	90	36	55.6	3.95	
Santa Rosa	69	25	50.0	12.93	
Sausalito				10.32	
Shasta	72	27	47.0	16.37	T.
Sierra Madre	82	37	55.4	5.96	
Sisson	61	12	36.7	15.90	88.0
Snedden				2.80	
Sonoma				10.50	
Sonora	66	34	48.7	8.63	4.0
Stirling City	56	17	39.6	25.22	38.0
Stockton	66	34	51.6	3.67	
Storey	75	32	50.9	2.47	
Summerdale	65	13	38.4	17.09	54.0
Summit	47	22	31.0	21.30	148.0
Susanville	57	12	37.7	5.91	22.0
Tehama*[1]	67	39	53.4	7.19	
Tejon Ranch	76	37	54.0	2.73	
Truckee*[1]	48	8	33.3	11.77	50.0
Tulare[c]	78	32	55.9	2.00	
Tustin				3.10	
Ukiah	73	28	48.4	13.82	
Upland	82	32	53.8	6.18	
Upperlake	70	24	44.6	10.14	0.5
Upper Mattole				35.91	
Vacaville*[1]	74	35	52.0	11.73	
Visalia	77	31	54.6	1.89	
Volcano	98	35	63.8	0.00	
Wasco	78	31	55.4	0.74	
Westpoint				13.49	10.0
Wheatland	70	35	51.8	7.22	
Willits	76	30	45.2	20.36	1.5
Willow	69	30	50.0	7.61	
Yosemite				12.53	48.8
Zenia	64	22	39.4	31.88	74.2
Colorado.					
Alford	63	— 8	36.2	0.30	4.0
Antelope Springs	57	—17	29.2	1.97	23.7
Ashcroft	51	— 5	26.1	3.99	50.0
Blaine	80	8	45.1	0.22	2.0
Boulder	69	9	43.6	2.37	16.0
Breckenridge	52	— 9	24.8	4.20	51.0
Buenavista				0.99	11.0
Burlington	76	0	42.4	0.48	1.5
Canyon	75	13	46.0	0.70	5.5
Castlerock	70	1	40.3	1.07	2.5
Cheesman	66	8	40.6	0.59	2.1
Cheyenne Wells	76	— 1	42.6	0.10	1.5
Clearview	53	— 6	30.8	1.74	27.0
Collbran	69	13	40.5	1.70	3.8
Colorado Springs	69	6	41.0	0.55	3.2
Conejos	61	5	34.7	0.16	T.
Cripplecreek				1.01	5.7
Durango	67	5	41.0	1.77	11.0
Fort Collins	70	10	39.8	0.51	2.0
Fort Morgan	71	5	41.8	0.20	T.
Fowler				0.59	T.
Fox	76	0	42.2	0.73	3.0
Fruita	72	11	43.4	0.94	2.5
Garnett	68	1	33.2	0.40	.....
Gilman				3.70	37.0
Gleneyre	71	5	40.2	0.83	3.8
Glenwood	68	7	38.6	1.90	4.0
Greeley	73	7	42.2	0.38	1.5
Grover				0.20	2.5
Gunnison	62	1	34.0	0.94	10.9
Halls Gulch	38	— 4	18.2	3.01	38.5
Hamps	72	1	39.6	0.06	0.5
Hoehne	76	2	43.1	0.33	.....
Holly	82	5	46.6	0.14	.....
Holyoke (near)	77[c]	— 4[c]	39.6[c]	0.30	.....
Husted	69	— 6	37.8	0.61	6.5
Lake Moraine	48	8[b]	31.2[d]	3.28	43.8
Lamar	84	10	48.5	0.01	T.
Laporte				0.38	3.0
Las Animas	82	4	43.7	0.25	.....
Lay	63[c]	—11[c]	32.2[c]	1.45	23.6
Leadville (near)	48	3	26.4	2.24	21.5
Leroy	71	0	39.6	0.35	2.9
Longs Peak	52	8	31.8	1.45	16.0
Mancos	65	5	38.2	1.96	6.3
Marshall Pass				4.24	54.0
Meeker	65	— 5	36.8	1.81	10.8
Montrose	68	10	41.0	0.86	3.0
Moraine	55	4	32.4	1.14	12.5
Pagoda	61	1	33.6	2.48	22.0
Parachute	70	15	42.6	1.92	3.0
Platte Canon				1.98	10.2
Rockyford	81	15	45.1	0.77	T.
Ruby				6.65	81.0
Saguache	65	5	34.8	0.50	2.0
Salida	66	9	39.6	1.51	7.8
San Luis	65[d]	— 3	37.1	0.24	3.0
Santa Clara	71	4	39.2	1.54	18.5
Silt	66	12	39.6	1.80	6.5
Sugar City				0.25	T.
Sugar Loaf				2.95	33.0
Trinidad	73	11	47.0	0.67	3.5
Victor	59	3	31.4	1.03	12.0
Vilas				0.13	T.
Wagon Wheel	60	—12	30.0	0.67	8.0
Wallet				0.29	T.
Waterdale	73	0	41.2	0.70	3.0
Westcliffe	63	0	38.0	1.44	19.5
Whitepine	46	— 8	23.8	3.68	43.4
Wray	78	2	42.0	0.04	0.5
Yuma				0.25	2.0
Connecticut.					
Bridgeport	66	10	34.9	3.54	8.7
Canton	65	— 2	30.0	4.40	7.0
Colchester	64	6	33.8	3.50	5.0
Falls Village				3.10	8.5
Hartford	63	8	33.2	3.16	5.0
Hawleyville	63	6	32.2	4.25	8.0
Lake Konomoc				3.22	.....
New London	61	10	34.7	2.30	2.8
North Grosvenor Dale	66	1	32.8	3.71	.....
Norwalk	66	7	33.8	3.88	8.5
Southington	66	6	33.8	3.65	6.5
South Manchester				2.86	6.0
Storrs	63	3	31.8	3.31	9.0
Voluntown	65	5	33.0	2.24	4.5
Waterbury	64	7	34.0	3.74	6.0
West Cornwall	57	4	29.4	4.46	14.8
West Simsbury				5.18	8.0
Delaware.					
Delaware City				3.53	2.1
Milford	73	19	42.6	3.12	T.
Millsboro	74	19	42.2	3.30	T.
Newark	68	17	38.9	3.75	5.0
Seaford	68	19	41.2	3.39	.....
District of Columbia.					
Distributing Reservoir*[5]	67	23	41.8	2.27	.....
Receiving Reservoir*[5]	66	22	42.6	3.00	.....
West Washington	72	20	43.0	3.73	0.2
Florida.					
Apalachicola	79	44	64.8	1.31	
Archer	89	39	66.0	1.55	
Avon Park	90	45	70.4	0.96	
Bartow	90	44	69.6	2.14	
Bonifay	86	39	65.0	4.00	
Brooksville	92	44	68.4	0.20	
Carrabelle	80	40	64.6	0.80	
Clermont	90	49	70.2	2.13	
De Funiak Springs	87	35	63.8	3.34	
Deland	89	43	66.7	.....	
Eustis	93	45	70.3	0.36	
Federal Point	88	42	66.7	2.33	
Fernandino	83	43	64.8	2.10	
Flamingo	89	55	73.4	T.	
Fort Meade	92	43	70.4	1.67	
Fort Pierce	84	52	68.8	3.27	
Gainesville	91	40	67.0	1.35	
Grasmere	87	48	68.0	.....	
Huntington	89	40	65.9	1.15	
Hypoluxo	85	54	72.0	0.71	
Inverness	92	39	66.9	0.34	
Jasper	90	38	65.4	1.61	
Johnstown	88	40	64.7	1.55	
Kissimmee	86	47	68.8	0.80	
Lake City	91	39	66.4	1.19	
Macclenny	94	37	65.8	0.97	
Madison	91	36	66.5	2.20	
Malabar	90	47	70.6	0.46	
Manatee	89	43	69.4	1.26	
Marco	91	52	72.6	2.36	
Marianna	90	35	64.6	2.91	
Merritt Island	83	54	69.9	1.83	
Miami	86	57	75.3	3.10	
Molino	87	34	63.6	3.80	
Monticello	88	41	65.3	1.77	
Myers	88	52	70.4	1.90	
New Smyrna	90	44	67.5	0.84	
Nocatee	90	42	70.2	2.79	
Ocala	93	41	68.0	0.15	
Orange City	92	39	69.2	1.12	
Orange Home	92	41	68.4	0.16	
Orlando	93	46	69.8	1.09	
Pinemount	92	39	64.9	2.00	
Rockwell	93	41	68.0	0.25	
St. Andrews	82	36	63.8	2.96	
St. Augustine	85	40	65.8	1.87	
St. Leo	90	44	68.4	0.19	
Stephensville	90	37	64.3	0.44	
Sumner	90	35	64.4	0.59	
Switzerland	86	40	65.2	2.71	
Tallahassee	83	30	65.2	1.55	
Tarpon Springs	89	46	68.0	1.52	
Titusville	89	47	69.2	1.12	
Wausau	89	30	62.4	3.70	
Wewahitchka	87	39	64.8	3.04	
Georgia.					
Abbeville				1.66	
Adairsville	75	27	53.8	4.68	
Albany	89[d]	34[c]	60.4[c]	2.53	
Americus	85	32	59.6	0.83	
Athens	79	29	52.2	3.10	
Blakely	88[c]	36[c]	64.8[d]	2.00	
Bowersville	78	28	54.0	3.68	
Butler				1.21	
Camak	80[c]	30[f]	55.2[f]	2.98	
Canton				4.43	
Carlton				2.64	
Clayton	74	22	50.0	6.64	
Columbus	86[b]	34[g]	59.6[h]	1.93	
Cordele	88	35	61.2	2.39	
Covington	84	28	56.8	2.51	
Dahlonega	76	25	49.9	3.96	
Dawson	87	35	62.2	3.36	
Diamond	81	12	49.9	6.21	
Dublin				1.87	
Dudley	87	33	62.0	2.10	
Eatonton	82	30	57.6	2.92	
Elberton	79	29	55.2	3.38	
Experiment	82	29	56.0	1.52	
Fitzgerald	90	35	62.0	1.05	
Fleming	90	34	62.8	1.62	
Gainesville	73	29	50.3	.....	
Gillsville	78	26	53.6	4.42	
Greenbush	78	27	53.8	6.25	
Greensboro	83	26	54.8	2.92	
Griffin	84	27	57.2	2.07	
Harrison	82	32	60.4	2.25	
Hawkinsville	89[c]			1.28	
Jesup	92	35	63.5	1.42	
Lost Mountain	78	26	54.2	4.52	
Louisville	81	33	59.2	3.13	
Lumpkin	87	30	62.1	1.46	
Marshallville	81	32	60.6	2.02	
Mauzy	89	36	64.8	1.43	
Milledgeville	84	32	57.5	1.25	
Millen	87	32[c]	60.9[c]	4.17	
Monticello	85	30	56.8	2.35	
Morgan	85	35	61.0	3.82	
Newnan	83	27	55.0	2.12	
Oakdale				2.96	
Oakfield				2.89	
Point Peter	81	25	53.2	2.48	
Poulan	87	34	61.4	2.41	
Putnam	85[i]	33[i]	58.8[i]	1.92	
Quitman	87	39	64.4	1.73	
Ramsey	76	24	53.2	5.56	
Resaca				5.23	
Rome	80	28	54.3	4.69	
St. Marys	87	38	63.3	1.54	
Statesboro	90	34	62.8	4.30	
Talbotton	85	30	58.4	3.18	
Tallapoosa	84[c]	22	52.7	2.42	
Thomasville	87	38	64.4	1.66	
Toccoa	78	27	51.4	4.80	
Valona	84	37	62.2	1.58	
Washington	80	30	54.6	2.88	
Waverly	89	37	63.0	1.76	
Waycross	88	40	63.8	1.49	
Waynesboro	83	32	58.4	1.41	
Westpoint	85	31	57.8	2.86	
Woodbury	84[j]	29[c]	56.9[h]	2.49	
Idaho.					
Albion	61	10	37.2	2.20	10.0
American Falls	59	13	36.2	4.46	.....
Blackfoot	58	14	34.4	.....	4.0
Blue Lakes	67	24	41.7	3.81	.....
Burnside	42	—13	25.5	2.40	14.0
Cambridge	51	18	35.5	6.54	.....
Chesterfield	53	4	31.0	4.13	16.0
Forney	61	— 5	32.9	4.34	36.0
Garnet	70	25	45.1	1.61	.....
Grangeville	57	13	35.2	3.64	13.6
Hailey	49	— 3	27.8	7.73	.....
Idaho City	52	4	35.6	.....	.....
Lake	42	—14	27.9	6.10	61.0
Lakeview	54	11	34.6	5.48	36.0
Lost River	48	— 1	27.2	2.58	21.0
Malad City	59	18	35.5	5.90	7.5
Meadows	49	7	30.6	2.95	23.0
Milner	63	19	39.6	1.32	.....
Moscow	54	13	34.2	2.77	.....
Murray	51	— 2	32.8	7.69	46.0
Oakley	64	19	36.6	2.30	4.0
Ola	53	19	38.6	7.49	3.9
Payette	64	24	41.6	4.63	.....
Pollock	73[c]	24	43.3[h]	2.72	.....

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Porthill	49	5	32.2	2.83	19.0
Priest River	50	3	32.2	4.76	19.5
Riddle	56	9	30.8	3.61	17.5
St. Maries	51	8	35.2	5.87	26.5
Soldier	46	−12	23.2	6.05	48.5
Vernon	47	− 1	28.0	4.22	33.5
Weston	60	10	34.6	4.28	13.5
Illinois.					
Albion	70	16	44.6	12.06	T.
Aledo	63	12	36.4	2.78	8.0
Alexander	73	19	41.0	4.51	1.5
Antioch	57	10	31.6	5.20	23.0
Ashton	63	13	34.5	4.03	13.3
Astoria	68	16	38.6	4.84	8.5
Aurora	66	12	33.3	5.02	8.3
Benton	79	20	46.8	8.41	
Bloomington	72	15	39.5	5.28	4.5
Bushnell	67	15	39.1	4.02	6.5
Cambridge	64	14	35.5	3.65	9.2
Carlinville	76	16	42.2	8.60	1.0
Carrollton	74[a]	17[c]	41.8[d]	5.77	T.
Charleston	75	18	41.3	9.42	1.1
Chester	.....	.....	.....	9.15	.....
Cisne	79	18	45.4	9.72	.....
Coatsburg	74	14	39.6	3.77	5.0
Cobden	78	21	47.8	6.75	.....
Danville	76	19	40.2	7.67	3.8
Decatur	75	18	40.5	7.29	2.2
Dixon	.....	.....	.....	3.07	8.0
Effingham	74	20	43.4	7.92	1.0
Equality	77	21	47.1	7.80	.....
Fandon	67	15	39.2	4.05	2.9
Flora	78	18	43.0	9.50	0.2
Friendgrove	75	19	44.4	12.63	T.
Galva	65	12	36.1	3.66	10.5
Grafton	.....	.....	.....	6.17	0.5
Greenville	77	18	43.0	11.43	0.4
Griggsville	75	17	42.5	5.60	T.
Halfway	76	21	46.4	5.97	
Havana	70	17	39.6	4.32	4.0
Henry	70	12	38.4	4.28	13.3
Hillsboro	76	15	42.3	6.53	1.0
Hoopeston	.....	.....	.....	7.36	8.5
Joliet	67	16	36.2	4.97	11.1
Kishwaukee	57	11	33.2	4.43	13.0
Knoxville	65	11	35.9	3.58	9.5
Lagrange	58	14	34.6	5.30	15.0
Laharpe	65	15	37.9	5.17	7.5
Lanark	61	9	34.2	2.68	5.5
La Salle	.....	.....	.....	2.67	8.0
Loami	.....	.....	.....	4.65	2.5
McLeansboro	78	20	45.4	8.89	T.
Martinsville	74	17	41.6	7.97	0.7
Martinton	76	15	38.0	4.08	0.5
Mascoutah	78	20	41.6	7.78	.....
Mattoon	76	22	46.6	7.88	2.1
Minonk	70	14	37.2	3.95	6.5
Monmouth	64	12	36.6	3.62	9.6
Morrison	62	12	35.7	3.86	11.3
Morrisonville	74	18	41.7	8.67	1.0
Mount Carmel	.....	.....	.....	12.84	T.
Mount Pulaski	72	18	40.4	5.53	3.5
Mount Vernon	78	19	44.2	10.91	T.
New Burnside	77	21	49.0	7.48	T.
Olney	77	18	43.8	10.60	1.1
Ottawa	70	17	38.6	4.87	9.0
Palestine	76	14	43.0	9.76	T.
Pana	75	18	41.1	7.86	1.5
Peoria a	.....	.....	.....	4.58	5.9
Peoria b	72	19	39.4	4.42	5.3
Philo	75	16	39.2	6.57	4.1
Plumhill	80	20	45.0	7.65	.....
Pontiac	70	17	38.8	5.73	7.0
Rantoul	73	16	39.0	6.78	4.0
Raum	78	19	46.2	8.47	
Riley	63	11	33.6	3.98	12.9
Robinson	75	17	48.0	11.98	0.2
Rushville	69	16	40.2	5.05	5.5
St. Charles	65	11	34.7	5.42	12.5
St. John	78	20	45.8	8.26	T.
Shobonier	78	19	43.0	6.43	.....
Streator	71	16	38.1	5.76	5.3
Sullivan	70	17	40.6	9.12	1.0
Sycamore	63	12	33.0	4.66	10.5
Tilden	78	20	45.8	8.66	.....
Tiskilwa	66	13	35.7	3.78	8.0
Tuscola	76	17	38.7	7.43	4.0
Urbana	72	11	38.4	7.66	4.0
Walnut	66	15	36.4	2.89	9.1
Winchester	73	19	40.7	3.69	3.0
Windsor	75	16	41.0	7.18	1.8
Winnebago	63	12	33.8	4.55	13.0
Yorkville	66	14	34.9	4.96	11.0
Zion	60	10	35.7	3.90	13.0
Indiana.					
Anderson	71	19	40.4	8.18	1.0
Angola	67	11	34.2	7.72	15.1
Auburn	65	15	35.8	5.37	.....
Indiana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bloomington	74	21	39.8	9.86	T.
Bluffton	70[e]	17[e]	37.9[e]	7.95	4.1
Butlerville	75	17	43.2	9.20	0.7
Cambridge City	70	16	38.5	8.25	0.8
Columbus	75	17	42.1	8.67	0.5
Connersville	75	15	42.0	8.03	1.8
Crawfordsville	79	11	40.7	8.61	.....
Delphi	70	19	36.6	7.46	6.0
Elkhart	60	14	34.6	4.22	9.5
Farmersburg	75	18	42.4	8.90	
Farmland	69	19	40.0	10.02	4.8
Fort Wayne	71	16	37.2	7.35	4.8
Franklin [1]	73	23	42.2	8.69	0.5
Greencastle	74	17	40.4	8.80	3.1
Greenfield	73	20	39.7	10.05	T.
Greensburg	75	15	42.0	8.87	1.5
Hammond	62	12	36.0	.....	.....
Hector	70	18	37.4	9.70	2.0
Holland	78	20	46.8	10.41	T.
Huntington	71	17	37.4	7.66	5.5
Jeffersonville	77	22	46.4	7.01	T.
Kokomo	71	19	38.6	5.79	4.5
Lafayette	73	19	37.6	7.25	3.2
Laporte	70	15	37.0	4.70	9.0
Logansport	72	18	37.4	4.50	0.5
Madison	80	18	45.6	9.01	0.5
Marengo	78	19	45.6	8.17	0.3
Marion	72	18	39.7	8.28	3.5
Markle	70	15	38.2	6.60	3.0
Mauzy	71	16	39.8	8.41	2.5
Moores Hill	75	15	42.3	8.50	1.5
Mount Vernon	76	25	44.8	8.72	.....
Northfield	70	16	38.6	9.25	3.0
Paoli	78	16	44.1	10.10	2.0
Princeton	78	20	45.0	8.06	T.
Rensselaer	68	17	37.4	5.91	7.0
Richmond	71	15	41.2	9.03	0.3
Rockville	75	18	40.8	8.51	1.0
Rome	80	17	44.0	7.30	T.
Salem	79	16	44.8	10.19	1.0
Scottsburg	77	20	46.0	9.41	0.1
Seymour	77	20	44.5	9.25	1.0
Shelbyville	72	18	42.4	8.02	T.
South Bend	69	11	32.5	5.51	15.5
Syracuse	67	15	35.8	6.57	8.5
Terre Haute	74	23	45.4	8.94	2.0
Topeka	65	15	35.7	3.22	T.
Valparaiso	67	11	37.0	4.98	.....
Veedersburg [c]	74	21	42.6	.....	.....
Vevay	78	21	46.6	8.35	0.5
Vincennes	78	19	43.1	10.74	0.2
Washington	80	19	42.0	13.73	1.0
Winamac	70	16	37.8	3.24	T.
Worthington	77	18	45.5	10.50	T.
Indian Territory.					
Ardmore	93	20	57.0	0.49	
Chickasha	93	11	59.4	0.37	
Claremore	90	16	54.6	0.92	
Coalgate	90	21	53.0	4.60	
Durant	92	23	57.5	2.41	
Fairland	87	18	53.0	1.73	
Goodwater	89	21	59.6	3.85	
Hartshorne	85[d]	25[d]	55.6[d]	4.37	
Healdton	99	14	62.0	0.03	
Holdenville	91	20	58.0	1.14	
Marlow	91	21	57.4	T.	
Muskogee	85	19	52.1	1.32	
Okmulgee	89	17	58.0	1.94	
Pauls Valley	93	13	58.8	0.00	
Ravia	89	29	59.8	3.82	
South McAlester	.....	.....	.....	4.35	
Tahlequah	91	22[c]	55.8[c]	1.11	
Tulsa	.....	.....	.....	0.53	
Vinita	89	15	54.0	1.43	
Wagoner	87	24	58.5	1.50	
Webbers Falls	88	16	56.1	3.53	
Iowa.					
Albia	68	8	35.5	2.55	7.0
Algona	59	0	31.9	1.34	1.0
Allerton	72	8	37.6	3.13	3.2
Alta	69	0	31.9	1.50	0.6
Amana	56	10	35.6	2.83	7.5
Ames	62	5	35.0	1.63	1.5
Atlantic	69	2	36.4	2.23	4.5
Audubon	67	0	34.5	0.81	5.0
Baxter	62	5	35.4	1.91	2.0
Bedford	68	8	38.0	4.57	5.0
Belknap	65	10	36.8	3.72	10.0
Belleplaine	57	7	33.2	3.36	12.8
Bonaparte	69	10	36.9	2.73	4.0
Britt	57	− 1	32.4	1.63	0.9
Buckingham	.....	.....	.....	2.46	2.1
Burlington	67	13	38.6	3.05	.....
Carroll	66	2	34.4	0.96	3.5
Cedar Rapids	59	10	34.0	2.07	0.2
Chariton	71	7	36.4	3.23	.....
Charles City	59	3	31.2	1.67	2.5
Clarinda	70	5	36.0	2.83	8.0
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Clearlake	60	− 2	31.8	1.20	2.0
Clinton	60	11	36.2	4.01	11.0
College Springs	70	8	37.8	2.16	6.5
Columbus Junction	66	− 3	36.0	2.68	5.0
Corning	68	1	36.4	2.91	5.5
Corydon	71	3	35.8	3.24	3.0
Cresco	52	0	27.0	.....	.....
Cumberland	.....	.....	.....	3.20	3.0
Decorah	57	2	31.6	2.22	4.5
Delaware	55	6	32.0	2.82	10.0
Denison	68	4	35.0	.....	.....
Desoto	66	7	36.8	1.64	2.0
Dows	59	1	32.6	1.55	2.0
Earlham	63	5	34.3	1.19	3.0
Elkader	57	6	33.2	2.75	6.5
Estherville	59	− 2	30.0	1.98	.....
Fayette	58	2	31.6	3.64	6.8
Forest City	59	− 1	31.3	1.33	1.0
Fort Dodge	61	3	34.2	1.08	1.5
Fort Madison	.....	.....	.....	3.73	2.9
Galva [f]	60	0	30.8	.....	.....
Gilman	.....	.....	.....	1.74	0.6
Glenwood	71	5	38.6	0.75	4.0
Grand Meadow	50	3	32.2	3.01	5.0
Greenfield	68	5	35.6	1.96	3.2
Grinnell	58	7	34.8	2.80	4.3
Grundy Center	60	5	30.9	2.24	4.5
Guthrie Center	77	5	38.6	1.54	.....
Hampton	60	1	33.1	2.60	4.5
Hanlontown	57	− 1	30.9	1.34	1.2
Harlan	68	4	35.8	1.38	3.0
Hopeville	68	8	36.6	2.74	.....
Humboldt	60	3	34.2	1.19	.....
Ida Grove	62	3[c]	33.8	0.50	.....
Independence	.....	.....	.....	2.51	8.1
Indianola	63	12	36.3	2.55	6.1
Inwood	59	1	32.3	0.76	2.0
Iowa City	62	10	35.2	2.73	8.0
Iowa Falls	59	1	32.4	2.28	7.0
Jefferson	60	0	33.8	1.98	3.0
Keosauqua	70	11	26.8	3.59	5.5
Knoxville	70	8	37.4	2.68	3.8
Lacona	.....	.....	.....	3.37	1.5
Larrabee	61	− 1	33.4	1.18	0.4
Leclaire	.....	.....	.....	2.99	7.7
Lemars	63	0	34.2	1.40	7.0
Lenox	67	6	36.6	2.49	3.0
Leon	63	8	36.6	3.58	5.5
Logan	69	5	37.4	1.29	3.0
Maple Valley	.....	.....	.....	1.31	1.5
Maquoketa	58	10	36.3	2.36	28.0
Marshalltown	61	5	34.0	1.75	4.0
Mason City	56	2	32.8	1.56	2.1
Monticello	55	3	35.2	1.44	10.0
Mountayr	72	7	38.0	3.20	6.8
Mount Pleasant	68	10	37.4	3.57	4.3
Mount Vernon	61	7	34.4	2.34	11.6
New Hampton	55	1	30.4	2.18	4.0
Newton	58	5	34.6	1.95	4.0
Northwood	56	0	32.0	1.45	2.0
Odebolt	65	2	34.8	1.06	1.8
Ogden	72	1	33.3	1.61	.....
Olin	58	9	34.9	3.22	8.2
Onawa	66	4	37.1	0.87	2.0
Osage	51	1	31.6	1.82	3.3
Osceola	70	10	38.6	2.63	7.0
Oskaloosa	61	7	36.1	1.76	6.4
Ottumwa	78	10	38.6	3.93	7.8
Pacific Junction	71	6	37.6	1.46	5.1
Perry	64	6	35.4	2.10	.....
Plover	62	0	32.8	0.97	1.0
Primghar	60	.....	31.3	.....	.....
Redoak	66	10	38.1	1.88	4.0
Ridgeway	59	0	33.2	2.95	5.5
Rock Rapids	60	0	33.0	0.80	3.0
Rockwell City	60	2	34.0	1.75	1.0
Ruthven	55	3	28.2	2.25	.....
Sac City	60	3	33.4	0.89	2.0
St. Charles	64	7	36.8	1.00	5.7
Sibley	59	− 2	30.4	2.05	1.5
Sigourney	65	8	37.8	3.42	7.0
Sioux Center	59	0	32.4	1.85	8.0
Spirit Lake	60	− 2	30.2	1.39	3.5
Stockport	.....	.....	.....	3.61	4.0
Storm Lake	58	0	30.6	1.54	0.1
Thurman	68	2	36.0	1.85	3.0
Tipton	60	11	35.2	2.83	8.6
Toledo	60	7	34.8	2.85	7.0
Vinton	58	8	34.6	2.86	7.8
Wapello	64	15	37.2	3.68	6.5
Washington	65	7	35.6	2.70	4.5
Washta	.....	.....	.....	0.83	T.
Waterloo	58	6	34.2	2.84	6.5
Waukee	67	6	36.8	2.23	4.5
Waverly	58	4	32.4	2.05	5.8
Westbend	60	0	34.2	1.76	2.0
West Union	.....	.....	.....	2.73	5.0
Whitten	61	2	33.6	2.64	6.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Wilton Junction	61	11	36.3	2.77	6.0
Winterset	68	7	37.1	1.99	2.0
Woodburn	....	....	.....	2.24	6.5
Kansas.					
Achilles	83	9	42.8	1.35	0.5
Alton	86	6	46.6	1.14	1 0
Anthony	.....	.....	.....	2.03	
Atchison	74	13	42.5	2.40	4.5
Baker	72	10	39.0	2.75	6.0
Beloit	82	8	44.0	0.76	
Burlington	81	15	48.7	1.75	T
Chapman	85	12	47.1	1.12	2.4
Clay Center	83	10	44.1	0.97	T.
Coffeyville	91	17	53.6	1.57	.....
Colby	86	2	43.6	0.34	T.
Columbus	84	15	50.2	2.22	
Cunningham	90	11	50.4	0.85	
Dresden	83	2	44.8	0.45	0.5
Eldorado	80	13	49.6	3.30	T.
Ellinwood	88	9	48.0	0.09	.....
Emporia	82	13	48.1	4.01	T.
Englewood	88	16	52.5	0.01	
Enterprise	85	11	46.6	1.29	3.0
Eureka	.....	.....	.....	1.73	T.
Eureka Ranch	86	0	45.0	0.28	T.
Fall River	85	12	48.8	0.96	
Farnsworth	84	2	46.0	1.06	T.
Forsha	82	12	48.0	0.58	
Fort Leavenworth	76	13	44.6	4.24	3.0
Fort Scott	82	11	49.6	1.69	T.
Frankfort	79	9	41.8	1.79	5.0
Fredonia	85e	20e	50.5e	0.81	T.
Garden City	89	5	47.7	0.11	T.
Gove *1	82	6	43.8	1.00	
Grenola	82g	14g	49.0g	1.52	
Harrison	83	5	41.8	1.16	1.0
Holton	77	12	41.9	2.18	4.5
Horton	73	11	40.8	2.59	5.0
Hutchinson	90	8	48.0	0.33	
Independence	89	16	52.0	1.58	
La Crosse	87	3	46.4	0.13	T.
Lakin	84	4	46.8	0.27	T.
Lawrence	78	14	44.2	3.96	4.0
Lebo	79	14	46.2	2.64	1.0
Macksville	87	8	49.4	T.	
McPherson	88	10	46.0	0.67	
Madison	82	9	47.0	3.35	
Manhattan b	81	12	45.4	2.15	2.0
Manhattan c	84	12	43.6	2.17	1.0
Marion	76	12	47.2	2.10	T.
Medicine Lodge	87	13	53.2	0.42	
Minneapolis	87	9	45.3	0.24	T.
Moran	82	16	49.0	2.61	T.
Mounthope	79	12	49.6	1.59	
Ness City	82	2	48.1	0.18	
Newton	81	10	48.0	2.10	
Norton	85	— 1	42.4	0.50	T.
Norwich	81	11	50.6	3.01	
Oberlin	.....	.....	.....	0.25	
Olathe	79	13	46.0	3.48	2.0
Osborne	.....	.....	.....	0.40	0.8
Oswego	87	15	52.2	0.83	
Ottawa	81	12	45.0	2.70	0.2
Paola	81b	15b	47.5b	2.93	0.8
Pleasanton	82	17	49.0	1.80	
Pratt	89	12	50.2	T.	
Republic	82	6	42.7	1.39	0.5
Rome	84	14	51.6	1.05	
Salina	85	10	46.9	0.27	T.
Sedan	93	13	51.5	1.65	
Toronto	83	9	48.4	1.70	
Ulysses	85	5	46.9	T.	T.
Valley Falls	78	11	42.2	2.25	4.0
Viroqua	85	6	47.2	T.	T.
Wakeeney	.....	.....	.....	1.50	1.5
Wallace	78	— 4	44.8	0.08	T.
Walnut	83	17	50.1	1.90	T.
Wamego *1	79	12	43.0	2.11	1.5
Winfield	81	14	52.2	1.48	
Yates Center	82	12	49.4	1.75	T.
Kentucky.					
Alpha	79	28	50.2	7.49	0.5
Anchorage	79	12	46.0	7.29	T.
Bardstown	81	20	47.0	5.63	0.5
Beattyville	81	17	46.0	4.70	2.0
Beaver Dam	79	21	45.1	5.66	
Berea	76	19	46.3	5.89	0.2
Blandville	80	23	47.6	6.49	
Bowling Green	84	18	49.6	5.00	
Burnside	77	19	50.1	5.67	0.2
Cadiz	81	22	48.6	5.49	
Calhoun	79	21	47.4	6.90	
Catlettsburg	83	20	48.4	4.62	T.
Earlington	81	20	48.1	7.00	
Edmonton	80	18	48.3	7.27	0.1
Falmouth	.....	.....	.....	7.62	1.0
Fords Ferry	78	18	49.7	8.49	
Frankfort	78	21	47.8	7.02	T.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Kentucky—Cont'd.	°	°	°	*Ins.*	*Ins.*
Franklin	79	24	49.5	.....	
Greensburg	80	18	44.6	5.52	
Highbridge	80	19	46.9	4.56	0.5
Hopkinsville	79	21	49.2	6.42	
Irvington	78	23	48.2	6.29	T.
Jackson	80	21	50.8	5.67	T.
Leitchfield	80	19	46.2	6.85	T.
Loretto	80	16	47.6	5.71	T.
Manchester	78	17	50.2	4.93	1.0
Marrowbone	81	20	50.2	6.25	
Mayfield	88	23	50.2	6.48	
Maysville	80	20	46.8	7.91	0.9
Middlesboro	75e	21e	50.4e	5.84	T.
Mount Sterling	78	21	44.6	6.42	1.0
Owensboro	79	23	45.8	8.99	T.
Owenton	78	16	46.6	7.54	0.8
Paducah a	.....	.....	.....	7.22	
Paducah b	81	24	49.4	6.99	
Princeton	79	21	49.6	5.28	
St. John	78	20	47.4	6.09	0.5
Scott	76	17	42.9	7.91	0.6
Shelby City	80	18	46.6	4.64	0.2
Shelbyville	80	22	47.0	6.08	1.5
Taylorsville	79	21	47.2	6.45	0.5
Williamsburg	80	20	48.2	3.78	0.6
Williamstown	76	17	45.0	7.45	1.5
Louisiana.					
Abbeville	86	35	66.5	5.43	
Alexandria	89	32	64.3	6.56	
Amite	86	33	64.9	3.84	
Baton Rouge	87	34	65.0	5.24	
Burnside	85	34	64.7	4.24	
Calhoun	85	24	60.4	4.35	
Cameron	79	37	65.4	3.01	
Caspiana	89	30	64.2	4.57	
Cheneyville	85	34	64.7	3.22	
Clinton	85	32	64.0	3.22	
Collinston	85	30	61.2	6.78	
Covington	85	35	64.7	2.36	
Donaldsonville	87	35	66.0	4.39	
Emilie	84	36	64.4	4.44	
Farmerville	85d	30e	64.2e	4.78	
Franklin	90	35	66.0	3.96	
Grand Coteau	85	34	65.6	4.59	
Hammond	85	33	64.4	4.11	
Houma	86	36	65.4	6.76	
Jennings	84	35	65.0	2.00	
Lafayette	84	34	65.0	4.66	
Lakeside	84	38	65.8	0.70	
Lawrence	85d	41b	67.8e	3.63	
Leesville	88	31	63.4	4.37	
Libertyhill	82	30	62.0	4.36	
Logansport	.....	.....	.....	2.74	
Mansfield	89	29	62.4	3.79	
Melville	89	30	66.0	5.47	
Minden	.....	.....	.....	0.94	
Monroe	87	29	62.5	5.87	
New Iberia	83e	35e	66.5e	2.70	
Opelousas	85	32	64.4	3.08	
Oxford	88	30	64.6	3.26	
Plain Dealing	88	27	59.8	3.46	
Port Eads	80	45	64.4	2.08	
Rayne	85	33	65.2	3.39	
Robeline	90	26	61.9	5.88	
Ruston	86	27	62.4	4.67	
St. Francisville	89	34	63.8	5.05	
Schriever	88	34	65.2	3.89	
Southern University	.....	.....	.....	5.13	
Sugar Experiment Station	82	38	65.8	4.69	
Sugartown	83	35	65.4	2.34	
Venice	84	34	64.8	2.49	
Wallace	88	35	65.7	4.38	
Maine.					
Bar Harbor	57	— 1	30.0	5.37	22.5
Belfast	56	— 8	28.6	3.14	9.0
Chesuncook	.....	.....	.....	2.11	16.0
Cornish	59	— 5	29.4	3.95	15.2
Danforth	.....	.....	.....	3.48	11.0
Fairfield	55	—11	28.4	3.78	7.2
Farmington	60	—20	27.6	3.13	5.0
Fort Fairfield	50	—23	21.4	0.95	5.0
Gardiner	60	—11	29.8	3.71	8.5
Grant Farm	.....	.....	.....	1.70	.....
Houlton	52	— 2	27.3	2.60	8.0
Jackman	.....	.....	.....	1.79	10.3
Lewiston	62	— 8	29.0	3.71	10.3
Madison	64	—18	30.2	2.79	6.0
Mayfield	49	—12	25.6	2.76	8.0
Millinocket	52	—16	26.0	3.86	4.0
North Bridgton	60	— 9	29.6	3.47	9.0
Oquossoc	55	—21	23.3	2.00	14.5
Orono	53	— 7	29.0	3.18	12.0
Patten	50	—15	24.0	1.02	8.0
Rumford Falls	62	—18	27.4	2.51	8 5
South Lagrange	54	—17	28.5	3.60	11.1
The Forks	.....	.....	.....	1.95	6.5
Thomaston	54	— 6	29.2	3.79	.....
Vanburen	53	—20	22.1	3.28	19.0

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Maine—Cont'd.	°	°	°	*Ins.*	*Ins.*
Winslow	57	—12	29.4	3.41	8.0
Maryland.					
Annapolis	66	20	41.8	3.79	.....
Bachmans Valley	66	16	37.2	3.76	7.5
Boettcherville	87	14	42.6	2.03	2.0
Boonsboro	78	19	40.8	.....	1.3
Cambridge	75	13	42.4	4.24	.....
Charlotte Hall	74	20	45.3	2.54	T.
Chase	67	18	40.6	3.16	1.5
Cheltenham	71	19	41.3	3.63	.....
Chestertown	68	18	41.0	3.76	3.0
Chewsville	72	14	39.5	1.61	1.0
Coleman	71	18	41.2	3.68	3.0
Collegepark	72	18	40.5	2.32	.....
Colora	.....	.....	.....	3.60	7.0
Cumberland	.....	.....	.....	1.66	2.0
Darlington	66g	15g	40.2g	3.62	3.0
Deerpark	78	6	38.2	.....	.....
Denton	.....	18	.....	3.68	1.0
Easton	72	18	42.6	3.41	.....
Fallston	64	15	38.8	3.19	5.0
Frederick	73	19	42.4	2.93	0.8
Grantsville	80	10	36.6	2.34	3.5
Greatfalls	76	15	41.8	2.87	.....
Greenspring Furnace	75	16	40.4	2.34	1.6
Hancock	79	15	41.4	1.92	1.5
Harney	.....	.....	.....	2.84	3.2
Jewell	68	20	42.2	3.02	0.5
Johns Hopkins Hospital	70	19	42.0	3.05	1.2
Laurel	72	16	41.2	3.33	.....
McDonogh	70	15	39.6	.....	.....
Mount St. Marys College	68	15	40.3	3.58	3.0
New Market	72	17	40.8	3.40	1.2
Oakland	83	5	37.9	2.32	3.0
Pocomoke City	73	20	44.6	3.26	T.
Prince Fredericktown	75	19	42.2	3.39	1.0
Princess Anne	74	19	43.6	2.96	T.
Sharpsburg	74	19	41.4	2.01	T.
Solomons	72	25	42.6	2.57	0.8
Sudlersville	72	18	41.6	3.58	0.5
Takoma Park	72	16	40.0	3.47	.....
Van Bibber	64	18	42.2	3.14	.....
Westernport	81	17	41.2	1.13	2.0
Woodstock	73	19	42.2	3.23	1.2
Massachusetts.					
Amherst	65	— 3	30.8	4.48	11.0
Bedford	57	— 3	32.0	1.81	3.0
Bluehill (summit)	66	3	32.3	3.52	11.9
Cambridge	69	3	33.4	2.85	.....
Chestnuthill	71	2	34.4	2.72	4.0
East Templeton *1	54	2	30.8	3.29	11.0
Fall River	59	8	34.3	2.60	7.0
Fitchburg a *1	56	— 5	31.1	3.00	10.2
Fitchburg b	67	— 4	31.2	2.89	10.0
Framingham	68	0	34.2	2.69	3.2
Groton	55	— 8	30.6	3.05	16.0
Hyannis	.....	.....	.....	2.46	8.0
Jefferson	.....	.....	.....	3.33	12.5
Lawrence	67	— 1	31.9	2.63	10.0
Leominster	.....	.....	.....	3.32	12.8
Lowell a	64	0	33.8	2.65	.....
Lowell b	68	— 2	33.2	.....	.....
Ludlow Center	60	— 3	28.2	3.68	6.0
Middleboro	63	8	33.8	2.86	5.2
Monson	66	4	32.0	3.72	14.0
New Bedford	60	11	33.8	2.38	6.0
Pittsfield	.....	.....	.....	2.67	11.5
Plymouth *1	.....	.....	.....	2.47	4.0
Princeton	.....	.....	.....	3.56	12.0
Provincetown	52	18	34.8	1.52	3.0
Salem	.....	.....	.....	2.37	7.5
Somerset *1	63	4	34.6	3.58	6.0
Sterling	.....	.....	.....	3.01	10.0
Taunton	65	6	34.0	2.47	5.5
Webster	.....	.....	.....	3.09	12.2
Westboro	70	— 2	33.6	2.96	10.0
Weston	68	— 2	32.4	2.81	10.8
Williamstown	60	4	30.0	1.51	10.0
Winchendon	.....	.....	.....	3.01	8.0
Worcester	66	4	32.9	2.34	11.2
Michigan.					
Adrian	70	12	34.2	2.60	.....
Agricultural College	64	8	30.2	3.45	14.5
Allegan	58f	10d	31.6e	2.54	11.0
Alma	51	2	29.6	3.42	14.0
Ann Arbor	62	10	32.4	4.80	11.4
Arbela	58	7	31.0	6.70	11.0
Baldwin	53	0	28.6	.....	16.2
Ball Mountain	56	5	29.6	4.53	16.2
Battlecreek	64	10	32.0	4.33	16.0
Bay City	54	1	29.8	3.05	11.0
Benzonia	51e	— 1d	27.4e	1.47	3.5
Berlin	56	7	31.2	3.27	9.2
Berrien Springs	65d	12e	36.4d	5.86	18.5
Big Rapids	49	— 6	27.4	3.66	7.0
Birmingham	56b	13g	30.2b	1.55	12.6
Calumet	44	— 7	21.2	2.04	21.0
Cassopolis	64	9	33.4	6.04	12.5

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Charlevoix	49	−10	26.2	.....	6.0
Charlotte	66[g]	10[g]	31.7[g]	2.15	18.2
Chatham	47	−20	21.6	2.27	21.8
Cheboygan	49	2[g]	24.7[g]	0.70	6.0
Clinton	62	10	33.8	4.79	13.5
Coldwater	67	10	34.0	3.55	15.0
Deer Park	45	−16	29.6	1.49	6.0
Dundee	65	9	33.7	5.45	15.5
East Tawas	47	−10	26.1	4.49	5.0
Eloise	63	9	33.0	.....	.....
Ewen	45	−25	19.2	.....	.....
Fennville	61[c]	8	32.8	4.87	16.5
Fitchburg	62	8	30.0	5.70	25.0
Flint	57	9	30.0	3.08	8.5
Gaylord	54	−15	24.0	1.30	10.0
Gladwin	54	−14	27.2	2.70	12.0
Grand Haven	55	8	31.4	2.16	.....
Grand Marais	46	−15	21.6	1.94	15.0
Grape	69	13	33.8	3.16	7.8
Grayling	46	−20	25.2	1.50	10.0
Hagar	65	10	33.8	4.62	11.2
Harbor Beach	50	−1	28.0	1.05	5.0
Harrison	49[c]	5[c]	27.2[c]	2.67	8.0
Harrisville	47	−5	24.0	2.50	13.0
Hastings	63	6	31.4	5.05	20.7
Hayes	50	−5	27.5	2.31	11.0
Highland	.....	.....	.....	5.98	15.4
Hillsdale	67	8	32.2	4.32	12.0
Humboldt	40	−31	18.4	2.30	23.0
Iron Mountain	45	−11	24.7	1.47	13.0
Iron River	46	−20	21.8	1.30	4.0
Ironwood	45	−13	22.2	2.31	22.6
Ishpeming	43	−18	20.7	4.80	30.5
Ivan	44	−14	22.1	2.82	8.5
Jackson	66	11	33.6	3.72	18.5
Jeddo	56	4	29.9	3.20	7.7
Kalamazoo	62	10	32.8	4.43	20.0
Lake City	50	0	26.0	.....	.....
Lansing	65	10	30.3	3.87	18.2
Mackinac Island	47	−4	23.8	7.45	16.0
Mackinaw City	53	−9	23.0	2.90	12.0
Mancelona	48[d]	−15	24.2	0.40	4.0
Manistee	55	−2	30.1	1.30	9.0
Marine City	58	1	31.3	3.95	9.0
Menominee	47	−4	26.8	2.04	3.0
Midland	.....	.....	.....	0.60	4.5
Mio	46	−13	24.5	2.84	14.7
Montague	55	6	29.4	3.30	13.0
Mount Clemens	60	6	30.0	.....	18.0
Mount Pleasant	51	.....	.....	1.37	12.0
Muskegon	50	6	30.0	3.73	14.0
Newberry	45	−20	19.2	.....	.....
Old Mission	48	−1	26.1	2.80	4.0
Olivet	62	10	31.8	5.21	14.1
Omer	49	−15	24.2	1.76	2.0
Onaway	48	−9	24.6	.....	.....
Ovid	64	9	30.4	4.64	19.0
Owosso[e]	64	10	33.0	.....	.....
Petoskey	48	−6	25.5	2.90	13.5
Plymouth	58	6	31.5	.....	7.0
Port Austin	49	−5	27.6	2.30	16.0
Powers	48	−12	24.8	.....	5.0
Reed City	51	−7	27.6	2.61	4.8
Roscommon	47[d]	−22[c]	25.1[c]	1.90	8.0
Saginaw (W. S.)	58	6	30.8	3.72	14.5
St. Ignace	48	−2[c]	24.4[c]	.....	.....
St. Johns	62	8	31.9	.....	.....
St. Joseph	.....	.....	.....	2.40	12.0
Slocum	50	4	29.8	.....	16.0
South Haven	63	9	32.6	7.32	18.0
Thomaston	46	−26	19.4	.....	.....
Thornville	57	9	31.2	2.35	8.0
Traverse City	49	−4	27.6	1.21	7.1
Vans Harbor	48	0	24.3	.....	17.5
Vassar	54	5	29.9	3.10	9.0
Wasepi	61	10	33.4	6.98	20.0
Webberville	63	8	31.0	6.21	28.5
West Branch	49[d]	−8[c]	26.0[d]	2.01	17.0
Wetmore	45[c]	−21[b]	22.0[d]	1.31	11.1
Whitefish Point	46	−20	19.8	2.01	10.9
Ypsilanti	63	10	31.2	4.92	15.2
Minnesota.					
Ada	45	−20	20.8	.....	.....
Albert Lea	56	.....	.....	1.35	1.0
Alexandria	52	−13	21.5	1.70	13.0
Angus	40	−22	17.0	.....	.....
Ashby	44	−13	23.2	1.12	6.5
Beardsley	55	−10	26.6	1.05	3.0
Beaulieu	44	−11	21.1	0.42	5.5
Bemidji	45	−21	21.0	3.54	.....
Bird Island	52	−7	27.6	1.46	3.5
Brainerd	50	−16	19.7	1.65	16.5
Caledonia	55	0	31.6	2.33	4.5
Collegeville	46	−9	25.8	1.42	9.2
Crookston	41	−22	16.0	2.81	26.1
Currie	56	−7	27.9	.....	.....
Deephaven	.....	.....	.....	1.50	2.0
Detroit City	42	−17	18.8	0.95	7.5
Faribault	57	−4	29.0	1.60	2.2
Farmington	52	−5	27.8	1.77	5.5
Fergus Falls	46	−13	23.0	1.14	8.5
Floodwood	45	−25	20.8	1.62	.....
Glencoe	54	−6	27.1	0.35	3.5
Grand Meadow	56	−1	29.6	2.27	3.5
Hallock	47	−22	16.0	2.61	13.2
Lake Winnibigoshish	41	−24	18.1	2.33	21.4
Leech	54	−11	20.2	2.49	20.8
Long Prairie	45	−17	23.2	2.04	11.5
Luverne	63	−1	31.1	0.85	1.5
Lynd	58	−7	27.8	0.71	0.1
Milaca	49	−18	23.8	0.95	3.0
Milan	54	−9	26.0	0.85	6.0
Minneapolis[3]	52[a]	−6	27.9	1.60	3.6
Montevideo	54	−8	28.1	0.79	2.5
Morris	48	−12	24.0	1.27	9.0
Mount Iron	48	−24	18.6	3.72	27.0
New London	52	−12	25.7	1.46	5.5
New Richland	56	−3	32.0	0.88	2.8
New Ulm	57	−4	29.7	1.24	3.2
Park Rapids	39	−20	17.0	1.71	16.9
Pine River	44	−27	19.6	1.95	8.0
Pipestone	52	−4	28.8	0.08	T.
Pleasant Mounds	59	−2	30.8	1.62	3.5
Pokegama Falls	46	−41	18.4	1.96	15.1
Redwing[a]	.....	.....	.....	1.09	5.0
Reeds	.....	.....	.....	0.64	5.3
Rolling Green	53	−2	29.8	2.07	3.0
St. Charles	56	−2	30.0	0.80	8.0
St. Cloud	53	−9	26.7	1.06	4.0
St. Peter	58	−3	30.6	1.04	0.2
Sandy Lake Dam	44	.....	.....	1.87	15.1
Shakopee	54	−4	29.0	1.75	2.5
Tower	40	−26	15.6	2.10	14.0
Two Harbors	41	−16	20.8	1.80	20.5
Wabasha	52	0	30.6	1.50	3.0
Wadena	44	−16	21.6	2.04	11.4
Willow River	43	−24	21.0	2.08	15.3
Winnebago	58	−2	31.2	1.31	3.3
Winona	55	1	30.6	1.70	2.5
Wyoming	.....	.....	.....	1.78	8.0
Zumbrota	53	−3	28.6	.....	.....
Mississippi.					
Aberdeen	88	26	57.7	4.51	
Agricultural College	84[d]	27	58.4	5.49	
Austin	84	27	57.6	6.76	
Batesville	84	27	55.8	8.76	
Bay St. Louis	82	36	64.8	3.08	
Biloxi	84	35	65.0	2.39	
Booneville	81	26	55.7	7.88	
Brookhaven	86	29	62.2	3.97	
Canton	86	28	61.6	5.24	
Columbia[e]	87	26	61.4	.....	
Columbus	85	27	56.6	4.29	
Corinth	79	21	51.8	6.09	
Crystal Springs	87	29	61.6	5.31	
Duck Hill	85	27	57.6	8.77	
Edwards	83	29	60.4	7.37	
Fayette	85	31	62.1	4.75	
Fayette (near)	.....	.....	.....	4.49	
Greenville[a]	83	30	59.6	5.41	
Greenville[b]	86	29	58.4	5.35	
Greenwood	85	29	58.4	7.18	
Hattiesburg	88	31	63.4	2.69	
Hazlehurst	86	29	61.8	4.50	
Hernando	80	26	54.4	7.19	
Indianola	87	30	61.2	7.95	
Jackson	85	24	58.9	.....	
Lake	86	29	59.2	4.29	
Lake Como	85	30	62.6	3.26	
Leakesville	85	32	63.0	3.87	
Louisville	85	28	60.3	5.22	
McNeill	86	33	64.3	2.71	
Macon	87	26	58.0	2.25	
Magee	85	28	60.7	3.32	
Magnolia	86	31[f]	65.0[c]	3.99	
Natchez	88	31	63.6	4.60	
Nitta Yuma	85	31	63.2	5.51	
Okolona	82	27	56.4	5.32	
Patmos	.....	.....	.....	6.23	
Pearlington	85	35	66.0	2.55	
Pittsboro	84	26	58.0	4.72	
Pontotoc	81	26	56.4	6.45	
Poplarville	84	32	65.6	3.68	
Port Gibson	89	31	63.5	5.67	
Ripley	82	23[c]	51.3	7.80	
Shoccoe	86	25	61.0	6.38	
Stonington	.....	.....	.....	4.50	
Suffolk	87	29	63.0	4.41	
Swartwout	82	37	63.6	3.49	
Tupelo	83	27	55.8	6.13	
University	82	26	57.0	8.06	
Utica	85[c]	34[g]	63.4[c]	5.98	
Walnutgrove	85	28	60.6	4.61	
Watervalley	81	27	57.9	7.30	
Waynesboro	85	30	61.0	4.21	
Woodville	83	31	63.6	3.92	
Mississippi—Cont'd.	°	°	°	*Ins.*	*Ins.*
Yazoo City	87	29	59.1	5.02	
Missouri.					
Appleton City	83	14	47.0	4.05	T.
Arthur	81	12	48.6	2.33	
Avalon	71	13	40.5	3.73	3.0
Bethany	72	9	38.9	4.48	4.0
Birchtree	82	16	49.2	6.73	
Blue Springs	79	15	43.8	2.63	0.6
Boonville	.....	.....	.....	4.68	0.5
Brunswick	80	16	40.2	4.12	3.0
Caruthersville	79	25	52.4	5.65	
Conception	70	9	39.0	2.79	3.5
Darksville	80	15	42.4	3.86	1.0
Dean	87	13	51.9	2.05	
Desoto	.....	.....	.....	6.22	
Downing	.....	.....	.....	3.06	7.5
Edgehill	80	18	46.6	9.68	
Fairport	.....	.....	.....	3.13	3.0
Fayette	80	14	42.1	3.25	0.5
Fulton	85	11	46.2	3.23	T.
Gano	85	13	48.0	7.60	T.
Glasgow	79	17	42.5	2.68	1.5
Gorin	.....	.....	.....	2.84	3.0
Grant City	73	9	39.3	3.29	3.0
Halfway	83	15	49.2	2.33	T.
Harrisonville	81	14	42.8	2.02	0.3
Hazlehurst	.....	.....	.....	3.09	3.0
Hermann	.....	.....	.....	3.05	T.
Houston	81	13	48.3	7.16	T.
Huntsville	80[c]	15[c]	43.4[c]	3.93	1.5
Ironton	80	16	46.6	11.49	T.
Jackson	85	19	49.2	6.65	
Jefferson City	84	16	44.4	2.63	T.
Joplin	85	18	52.3	1.89	T.
Kidder	76	13	40.0	2.71	2.1
Koshkonong	83	18	49.4	5.66	
Lamar	86	17	50.2	1.48	T.
Lamonte	.....	.....	.....	2.58	
Lebanon	84	15	47.3	3.77	
Lexington	80	17	44.2	3.33	2.0
Liberty	79	14	43.8	4.25	2.0
Lockwood	.....	.....	.....	2.40	
Louisiana	83	15	42.6	4.63	1.0
Macon	81	14	42.3	3.27	2.5
Marblehill	80	18	48.4	5.65	
Marshall	80	16	44.1	1.99	0.5
Maryville	70	9	36.2	3.23	5.8
Mexico	84	16	42.8	3.84	0.8
Miami[b]	80	17	42.0	2.92	2.7
Monroe City	80	15	40.4	3.10	3.0
Montreal	85	8	47.0	2.89	T.
Mountaingrove	81	17	47.4	7.30	T.
Mount Vernon	85	14	49.4	4.36	
Neosho	86	15	51.9	2.46	
Nevada	.....	.....	.....	2.26	
New Haven	83	20	46.7	4.74	T.
New Madrid	.....	.....	.....	8.29	
New Palestine	83	19	48.0	2.77	0.1
Oakfield	81	18	45.6	5.84	T.
Olden	86	10	50.1	7.58	
Oregon	73	10	40.1	2.90	7.0
Palmyra	70	16	40.8	3.30	6.0
Pine Hill	.....	.....	.....	9.28	
Princeton	76	10	37.9	3.03	4.5
Protem	84	15	51.4	5.83	
Rockport	.....	.....	.....	2.67	7.0
Rolla	.....	.....	.....	4.47	T.
St. Charles	80	20	45.6	5.77	T.
St. Joseph	.....	.....	.....	2.58	2.0
Sarcoxie	.....	.....	.....	3.99	
Sedalia	81	16	46.5	2.09	T.
Seymour	81	13	47.8	7.14	T.
Sikeston	78	23	50.2	7.16	
Steffenville	78	14	40.6	3.61	2.2
Sublett	76	11	39.8	5.10	5.0
Trenton	75	13	40.4	3.53	3.5
Unionville	70	9	36.4	3.84	7.5
Vichy	85	11	47.4	3.62	T.
Warrensburg	81	17	47.4	2.05	
Warrenton	74[c]	17[a]	40.5[b]	4.41	0.5
Warsaw	.....	.....	.....	1.74	T.
Wheatland	.....	.....	.....	1.64	T.
Willowsprings	82	11	48.2	10.37	
Zeitonia	82[d]	22[g]	49.6[c]	7.60	
Montana.					
Adel	52	−34	23.6	2.23	22.0
Anaconda	51	−14	26.8	0.95	9.5
Augusta	58	−21	22.8	2.18	18.0
Billings	50	−10	25.8	.....	.....
Boulder	52	−12	26.8	0.61	4.3
Bozeman	50	−20	25.0	2.98	28.1
Butte	59	−6	29.3	2.05	20.5
Canyon Ferry	54	−12	28.4	1.43	8.2
Chester	46	−26	16.2	.....	.....
Chinook	47	−21	15.1	0.81	.....
Crow Agency	58	−6	28.2	2.35	23.5
Culbertson	44	−21	14.0	1.79	15.0
Cutbank	55	−30	14.1	0.80	8.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Montana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Dayton	52	— 5	30.2	1.93	13.2
Deerlodge [b]	49	—10	27.2	.....	.....
Dillon	56	—14	30.3	1.38	12.1
Ekalaka	50	—10	25.5	.....	.....
Fort Benton	50	—18	19.8	1.00	10.0
Fort Harrison	60	— 3	31.8	.....	.....
Fort Logan	60	—10	24.5	.....	.....
Glasgow	45	—27	12.2	4.06	.....
Glendive	45	—13	16.6	2.20	22.0
Greatfalls	61	—12	25.6	0.65	6.5
Hamilton	56	1	33.8	1.26	9.0
Lamedeer	63	— 4	28.6	2.05	17.0
Lewistown	53	—13	26.3	1.90	17.0
Livingston	58	— 8	32.4	1.38	12.0
Marysville	46	—17	21.4	3.27	38.8
Missoula	53[c]	5	33.6	1.97	16.5
Ovando	49	—13	24.8	2.10	16.0
Parrot	58	— 8	32.2	1.06	7.9
Philipsburg	53	—11	28.6	1.58	9.8
Plains	51	4	34.2	1.35	11.0
Poplar	41	—17	13.3	4.15	35.0
Redlodge	53	—18	25.6	2.15	32.0
Ridgelawn	42	—20	15.2	1.65	16.5
Ruby [c]	59	— 6	31.4	.....	.....
St. Pauls	51	—10	24.0	4.00	40.0
St. Peter	53	—14	24.4	1.01	15.5
Springbrook	44	—11	18.2	3.60	34.4
Toston	57	— 5	30.6	.....	.....
Troy	56	0	32.3	4.51	17.5
Twin Bridges [d]	53	— 6	30.8	.....	.....
Two Dot	47	—12	26.2	1.59	18.0
Utica	53	—11	25.4	0.79	12.0
Wibaux	47	—12	27.1	1.25	11.5
Wolf Creek	57	—17	27.2	0.83	22.5
Wolsey	47	—36	21.3	2.24	29.2
Yale	59	— 8	24.8	1.70	17.0
Nebraska.					
Agate	70	— 7	35.0	0.25	0.8
Agee [*1]	68	— 2	31.9	0.13	.....
Albion	74[d]	8[d]	38.0[d]	0.60	5.0
Alliance	72	— 4	38.0	T.	T.
Alma	84	1	41.6	0.13	
Ansley	77	— 3	39.1	0.40	4.0
Arapahoe	.....	.....	.....	0.20	T.
Arcadia	.....	.....	.....	T.	T.
Ashland *a*	79	2	38.4	0.74	3.0
Ashland *b*	.....	.....	.....	0.91	3.0
Ashton	.....	.....	.....	0.12	T.
Auburn	74	7	39.8	2.11	4.0
Aurora	.....	.....	.....	0.45	.....
Bartley	82	— 2	43.2	0.17	1.0
Beatrice	79	8	42.2	1.86	4.5
Beaver	82	1	43.6	0.27	T.
Bellevue	.....	.....	.....	1.92	5.1
Benkleman	.....	.....	.....	0.05	
Blair	75	3	36.8	0.95	3.0
Bluehill	.....	.....	.....	0.80	0.5
Bradshaw	.....	.....	.....	0.89	3.0
Bridgeport	75	10	41.4	T.	T.
Broken Bow	76	0	39.4	0.20	1.5
Burchard	.....	.....	.....	1.90	4.0
Burwell	.....	.....	.....	0.60	6.0
Callaway	78	0[e]	40.8[b]	T.	T.
Central City	.....	.....	.....	0.60	3.0
Chester	.....	.....	.....	0.79	4.5
Cody	.....	.....	.....	0.02	0.2
Columbus	77	5	37.8	0.93	1.5
Crete	77	5	39.7	1.02	1.8
Crookston	.....	.....	.....	0.63	3.0
Culbertson	80	— 1	42.5	0.55	2.0
Curtis	79	— 1	39.3	0.40	2.0
David City	74	4	38.0	1.33	3.5
Dawson	76	10	41.4	1.66	3.0
Edgar	.....	.....	.....	0.83	0.2
Ericson	.....	.....	.....	0.20	2.0
Ewing	.....	.....	.....	0.91	3.0
Fairbury	84	6	39.4	2.04	3.0
Fairmont	80	4	38.2	0.54	1.0
Fort Robinson	69	— 2	36.4	0.10	1.0
Franklin	83	6	41.1	0.35	
Fremont	75	5	37.6	0.96	4.0
Fullerton	.....	.....	.....	0.48	2.3
Geneva	82	6	40.5	0.82	1.0
Genoa (near)	75	1	39.3	0.14	0.2
Gering	71	— 4	39.9	0.32	1.0
Gordon	.....	.....	.....	0.12	0.8
Gothenburg	80	1	40.8	0.38	1.5
Grand Island *b*	80	3	40.1	0.64	3.8
Grant	.....	.....	.....	T.	T.
Greeley	.....	.....	.....	0.10	1.0
Guide Rock	.....	.....	.....	1.49	
Haigler	.....	.....	.....	0.10	.....
Halsey	76	0	38.2	0.16	
Harvard	79	2	38.4	0.54	T.
Hastings [*1]	77	6	38.5	0.66	2.5
Hay Spring	69	— 5	32.3	0.12	T.
Hebron	79	7	41.4	1.17	0.5
Holbrook	.....	.....	.....	0.30	0.1
Holdrege	79	0	41.3	0.07	T.
Holly	.....	.....	.....	0.03	
Hooper [*1]	68	6	35.9	0.84	2.5
Imperial	77	— 2	40.1	0.13	0.2
Johnstown	.....	.....	.....	0.30	3.0
Kearney	79	2	42.0	0.14	0.5
Kennedy	75	— 2	37.0	0.26	2.0
Kimball	69	5	39.1	0.13	T.
Kirkwood	67	2	37.3	0.20	T.
Leavitt	75	4	37.5	0.72	0.5
Lexington	79	0	39.7	0.75	3.0
Lockridge	82	5	38.6	0.53	2.0
Lodgepole	75	— 4	39.2	T.	T.
Loup	78	2	38.8	0.14	
Lynch	70	3	36.0	0.48	2.0
McCook	.....	.....	.....	0.02	0.2
McCool Junction	.....	.....	.....	0.59	.....
Madison	73	10	36.4	0.20	1.5
Madrid	79	— 5	39.4	0.25	
Marquette	.....	.....	.....	0.40	2.0
Mason	.....	.....	.....	0.55	
Minden	80	2	39.8	0.47	1.5
Monroe	.....	.....	.....	0.19	0.7
Nebraska City *c*	73	8	40.6	2.51	3.0
Nemaha	.....	.....	.....	1.65	3.0
Norfolk	76	1	36.5	0.41	3.0
North Loup	78	1	38.7	0.63	1.8
Oakdale	71	3	35.4	0.48	2.6
Odell	.....	.....	.....	2.55	3.0
O'Neil	68	0	38.3	0.14	2.0
Ord	.....	.....	.....	0.27	
Osceola	.....	.....	.....	1.85	
Palmer	.....	.....	.....	0.45	4.5
Pawnee City	76	7	40.4	1.74	5.0
Plattsmouth *a*	.....	.....	.....	2.08	7.0
Plattsmouth *b*	.....	3	.....	1.78	5.0
Purdum	75	— 3	36.5	0.84	4.4
Ravenna	78	0	38.8	0.88	2.8
Redcloud	83	5	40.7	0.85	
Republican	.....	.....	.....	0.20	
Rulo	.....	.....	.....	2.58	4.2
St. Libory	.....	.....	.....	0.50	4.0
St. Paul	79	3	40.8	0.30	2.5
Salem	.....	.....	.....	1.55	3.5
Santee	70	3	36.7	0.50	0.1
Schuyler	.....	.....	.....	0.75	2.0
Seward	80	6	39.0	0.58	4.0
Smithfield	.....	.....	.....	0.25	1.5
Spragg	.....	.....	.....	0.20	2.0
Springview	67	3	37.1	0.21	2.0
Stanton	74	3	36.4	0.52	2.0
Strang	.....	.....	.....	0.50	1.0
Stratton	.....	.....	.....	0.48	
Stromsburg	.....	.....	.....	0.49	
Superior	80	5	38.4	1.39	0.5
Syracuse	.....	.....	.....	1.83	4.0
Tablerock	.....	.....	.....	1.55	5.0
Tecumseh	79	5	40.4	2.00	4.0
Tekamah	71	8	40.6	1.99	4.0
Turlington	75	7	38.1	1.70	5.0
University Farm	81	8	39.8	0.84	3.0
Wahoo	.....	.....	.....	0.54	3.0
Wakefield	68	2	35.4	0.40	1.4
Wallace	.....	.....	.....	0.20	
Wauneta	.....	.....	.....	0.71	2.0
Weeping Water	.....	.....	.....	1.19	4.5
Westpoint	72	3	37.4	0.33	3.0
Wilber	.....	.....	.....	0.90	3.0
Wilsonville	.....	.....	.....	0.51	
Winnebago	69	4	35.6	0.20	T.
Wisner	.....	.....	.....	0.27	0.5
Nevada.					
Amos	68	15	40.0	2.23	.....
Austin	58	13	36.6	0.88	.....
Battle Mountain	70	12	42.1	0.60	4.0
Belmont	57	2	33.7	0.31	1.0
Beowawe [*1]	59	22	37.6	0.65	3.0
Candelaria	68	16	43.6	0.46	T.
Carlin [*1]	62	26	40.6	1.40	12.0
Carson City	64	19	41.0	2.51	7.6
Cranes Ranch	.....	.....	.....	1.49	.....
Dyer	73	10	42.2	0.66	
Elko	58	11	38.8	3.85	14.5
Ely	67	0	38.4	1.13	3.0
Eureka	64	9	36.7	1.00	9.0
Fallon	69	15	43.8	T.	
Geyser	67	0	38.8	0.99	4.5
Glenbrook	.....	.....	.....	6.50	.....
Golconda [*1]	63	23	39.6	0.90	6.0
Halleck [*1]	75	20	35.8	2.01	8.2
Hamilton	44	22	34.6	2.00	20.0
Hawthorne	78	16	45.2	0.45	
Humboldt	66	18	40.8	1.63	2.5
Lee	.....	.....	.....	3.43	17.5
Lewers Ranch	64	18	40.4	9.10	13.0
Lovelocks [*1]	59	30	40.0	1.50	.....
Martins	77	18	46.2	1.46	2.0
Mill City [*1]	53	24	40.5	0.55	2.0
Nevada—Cont'd.	°	°	°	*Ins.*	*Ins.*
Morey	68	5	37.8	2.07	16.0
Palisade	67	15	40.4	0.63	.....
Palmetto	67	10	39.8	0.80	8.0
Pioche	70	15	43.6	1.34	4.0
Potts	69	1	36.0	0.30	3.0
Reno State University	62	19	40.5	2.12	.....
Sodaville	80	15	45.0	0.34	
Toano [*5]	50	11	31.4	0.40	4.0
Wabuska	70	10	43.2	0.71	T.
Wadsworth [*1]	64	10	43.2	1.50	T.
Wells [*1]	52	11	35.1	3.12	10.0
Wood	62	12	36.6	3.11	.....
New Hampshire.					
Alstead	54	— 6	28.5	3.00	7.5
Bartlett	.....	.....	.....	4.16	15.2
Berlin Mills	60	—20	25.0	1.81	4.3
Bethlehem	58	— 6	26.2	1.68	4.0
Breton Wood	.....	.....	.....	2.53	.....
Brookline [*1]	62	—15	31.6	2.90	11.0
Chatham	60	—18	25.4	1.65	11.5
Concord	61	—12	29.6	2.12	8.8
Durham	64	— 9	31.0	3.20	11.5
Franklin Falls	59	— 9	29.4	2.01	8.5
Grafton	57[d]	—15[d]	26.8[d]	2.42	11.0
Hanover	57	—12	27.8	1.71	4.3
Jefferson Highlands	.....	.....	.....	2.31	12.0
Keene	61	— 7	29.6	2.21	6.5
Littleton	57	— 8	26.6	2.31	7.5
Nashua	67	— 5	31.8	2.75	9.5
Newton	65	—11	30.4	2.40	11.5
North Stratford	.....	.....	.....	1.30	10.2
North Woodstock	.....	.....	.....	5.82	.....
Plymouth	58	— 8	27.9	2.84	10.9
Stratford	55	—18	25.8	2.65	5.0
New Jersey.					
Asbury Park	69	18	36.8	3.21	2.6
Barnegat	72	13	38.6	3.72	9.0
Bayonne	65	13	36.4	3.32	4.3
Belvidere	65	10	36.4	3.88	6.5
Bergen Point	65	14	36.5	4.21	6.5
Beverly	69	15	39.0	3.45	7.0
Blairstown	62	7	35.0	3.02	5.0
Bridgeton	69	15	41.4	3.76	0.5
Canton	.....	.....	.....	2.95	1.0
Cape May C. H.	71	15	40.0	2.89	T.
Charlotteburg	63	1	32.4	3.50	6.0
Chester	58	7	32.8	3.77	6.0
Clayton	68[c]	15[c]	38.4[c]	3.44	2.0
College Farm	67	12	36.8	2.38	2.5
Dover	60	7	32.0	3.49	6.2
Elizabeth	65	14	37.0	4.53	.....
Englewood	65	16	38.0	3.16	4.0
Flemington	65	12	36.9	3.67	7.0
Friesburg	67	16	39.2	3.81	4.5
Hightstown	64	15	37.0	3.64	2.0
Imlaystown	67	16	38.7	4.76	4.3
Indian Mills	69	14	39.4	3.50	2.0
Lakewood	69	14	38.0	3.83	2.0
Lambertville	65	13	37.6	3.52	8.5
Layton	61	2	32.9	3.49	7.0
Moorestown	68	15	38.4	3.83	5.7
Newark	65	13	35.4	3.56	7.3
New Brunswick	67	13	37.8	3.74	7.0
Newton	62	7	34.4	3.32	5.0
Oceanic [d]	70	16	37.6	2.84	2.8
Paterson	67	13	37.2	3.85	6.9
Pemberton	70	15	38.4	3.56	2.0
Phillipsburg	63	10	35.6	3.61	7.6
Plainfield	65	12	36.2	3.87	6.5
Pleasantville	.....	.....	.....	2.02	2.5
Rancocas	.....	.....	.....	4.17	5.5
Rivervale	69	7	36.4	3.62	9.0
Salem	68	13	40.9	3.51	2.5
Sandy Hook	65	16	36.2	3.27	3.5
Somerville	64	11	36.1	3.82	8.0
South Orange	67	12	35.2	3.39	5.5
Sussex	61	8	34.4	3.65	4.5
Toms River	71	14	38.2	3.62	2.8
Trenton	67	20	41.6	2.23	2.0
Tuckerton	72	12	38.1	2.92	5.8
Vineland	71	15	39.8	2.77	1.2
Woodstown	.....	.....	.....	3.21	2.0
New Mexico.					
Alamagordo	86	25	53.7	0.00	
Albert	79	22	51.1	T.	T.
Arabela	77	21	53.1	0.00	
Bellranch	.....	.....	.....	0.07	
Cambray	.....	.....	.....	0.00	
Carlsbad	91	29	62.1	0.00	
Cloudcroft	56	13	39.0	0.00	
Deming	.....	.....	.....	0.00	
Dorsey	77	12	45.1	0.25	3.0
Eagle Rock Ranch	75	12	43.4	0.52	5.2
Fort Bayard	74	23	49.4	0.32	2.0
Fort Stanton	72	9	46.4	0.03	
Fort Union	78	9	44.0	0.13	1.3
Fort Wingate	75	16	45.3	1.42	2.0
Fruitland	83	7	47.7	0.07	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Gage				0.00	
Golden				0.01	0.1
Las Vegas	74	12	46.2	T.	T.
Lordsburg				0.23	
Los Lunas	78	25	51.2	0.00	
Luna	71	10	42.8	0.00	
Mesilla Park	84	23	54.5	0.00	
Mountainair	71	8	44.5	0.14	
Raton	67	13	42.6	0.40	4.0
Roswell	85	22	55.2	0.00	
San Marcial	85	18	55.8	0.00	
Strauss				0.00	
Taos	68	12	42.0	1.28	2.0
Winsors	62e	5e	36.8e	0.61	.....
New York.					
Adams				6.24	26.5
Addison	59	4	32.0	2.79	5.0
Akron				3.55	.....
Alden	65	6	31.6	2.68	6.3
Amsterdam	59	— 5	28.6	2.82	13.1
Angelica	62	0	30.0	2.47	7.3
Appleton	66	8	31.9	2.49	.....
Arcade	59	— 8	28.4	5.05	14.0
Athens	63	7	32.6	2.98	10.0
Atlanta	61	— 2	29.8	3.59	7.5
Auburn	60	3	31.0	3.84	11.0
Avon	65	2	30.4	2.30	6.0
Ballston Lake	56	— 6	29.2	2.11	9.6
Beaver				5.50	19.0
Bedford	64	9	34.9	3.25	.....
Berlin	62	2	31.4	2.10	21.0
Blue Mountain Lake				4.70	23.0
Bolivar	63	2	30.3	4.23	5.5
Bouckville	53	— 2	27.8	2.68	11.0
Boyds Corners				3.77	.....
Brockport	62	7	30.6	3.02	10.9
Caldwell	55	—10	27.8	4.09	12.4
Canajoharie	60	— 3	28.5	2.02	15.9
Cape Vincent	47	2	27.2	3.18	9.8
Carmel	61	6	31.4	4.08	7.0
Carvers Falls	55	— 7	27.2	2.53	5.0
Chazy	50	— 8	26.1	1.70	8.0
Cooperstown	55	0	28.2	3.06	7.0
Cortland	56	— 2	29.4	2.85	8.5
Cutchogue	62	12	35.4	2.65	5.0
Deansboro				2.97	14.5
Dekalb Junction	55	0	27.7	2.99	5.5
De Ruyter	55	— 8	28.0	2.77	12.0
Easton				2.52	5.0
Elba	58	6	30.4	5.02	19.0
Elmira	63	6	33.8	2.52	2.8
Fayetteville	62	4	31.2	2.35	7.0
Franklinville	60	— 2	29.2	4.63	7.1
Gabriels	51	—18	23.2	3.75	9.0
Gansevoort				3.45	14.0
Glens Falls	52	— 6	28.4	3.01	6.2
Gloversville	48	—10	26.9	3.72	16.7
Greenwich	61	2	30.2	2.11	9.5
Griffin Corners	58	— 1	28.2	2.61	9.3
Harkness	54	— 4	26.8	0.73	4.5
Haskinville				3.37	6.1
Hemlock	60	4	30.9	3.35	.....
Indian Lake	51	—25	23.8	3.45	15.5
Ithaca	59	2	30.4	2.29	10.2
Jamestown	64	5	32.6	4.71	7.8
Jeffersonville	56	— 6	29.2	2.83	9.0
Keene Valley	59	— 7	27.2	2.55	7.0
King Ferry				2.16	10.7
Le Roy	65	7	30.8	2.94	10.8
Liberty	54	0	27.8	3.01	11.0
Littlefalls, City Res.	56	— 3	26.6	3.17	13.5
Lockport	65	9	31.3	3.20	.....
Lowville	52	— 4	26.3	3.82	8.8
Lyndonville				2.41	12.4
Lyons	58	8	31.2	5.40	22.5
Middletown	60	9	33.0	2.80	7.5
Mohonk Lake	59	5	29.9	3.94	17.5
Moira	60	0	27.8	3.21	10.0
Newark Valley				3.13	12.5
New Lisbon	57	— 5	27.8	2.98	10.5
North Hammond	50	0	26.6	2.50	6.0
Ogdensburg	52	— 2	27.0	1.75	3.5
Old Chatham				3.52	7.0
Oneonta	60	4	31.1	5.28	8.0
Oswegatchie	55	— 5	27.0	4.45	4.5
Otto	59	4	29.8	3.17	.....
Oxford	54	— 4	30.4	3.72	15.2
Oyster Bay	65	16	37.0	3.93	5.0
Palermo				4.15	27.9
Perry City	56	— 5	29.0	2.92	11.3
Plattsburg Barracks	64	— 6	25.0	0.20	0.8
Port Jervis	60	5	33.9	3.56	3.0
Potsdam	56	— 2	28.0	3.29	8.5
Primrose	66	8	35.1	4.51	10.0
Redhook				3.13	.....
Richmondville	60	2	29.5	3.27	10.0
Ridgeway	65	8	31.6	2.51	7.3
Ripley	66	8	34.0	5.30	1.6
Rome	58	1	30.3	3.68	14.0
Romulus	58	8	32.0	2.95	16.3
Salisbury Mills				2.98	4.5
Saranac Lake	57	—11	25.6	1.59	8.3
Saratoga Springs	51	— 5	27.8	2.42	16.0
Scarsdale	66	10	34.8	2.54	9.4
Setauket	63	15	35.3	3.35	6.0
Shortsville	61	5	30.4	1.82	5.4
Skaneateles				3.06	.....
Southampton	55	13	34.9	2.79	4.7
South Butler	55	0	29.5	.....	.....
South Canisteo	59	3	30.6	3.15	7.5
Southeast Reservoir				3.82	.....
South Kortright	59	0	29.5	2.75	10.7
South Schroon	51	—12	25.8	2.82	15.1
Spier Falls	53	— 7	28.5	3.23	15.0
Straits Corners s	58	— 4	27.3	.....	.....
Ticonderoga	55	0	29.2	1.87	16.0
Tupper Lake	58	— 9	25.6	3.20	4.9
Volusia	60	4	30.0	3.87	8.0
Wappinger Falls	63	10	32.6	4.03	15.0
Warwick				2.72	8.0
Watertown	58	2	29.4	3.08	9.0
Waverly	59	0	32.1	3.67	7.1
Wedgwood	56	5	27.7	3.12	10.8
Wells	52	—20	26.0	4.75	16.4
West Berne	65	— 3	28.0	2.12	11.0
Westfield b	63	7	32.2	3.58	.....
Windham	63	3	31.0	2.31	10.0
Youngstown				2.42	9.0
North Carolina.					
Brevard	77	20	49.0	6.76	
Brewers	76	20	47.1	3.39	
Bryson City				6.64	
Chapelhill		24		4.65	
Currituck				4.48	
Edenton	79	26	51.3	5.06	
Fayetteville	84	27	55.1	3.89	
Goldsboro	82	27	51.7	3.96	
Graham				3.65	
Greensboro	76	24	47.6	3.64	
Henderson	78	23	49.6	2.86	T.
Hendersonville	76	23	47.4	5.88	
Henrietta	82	24	51.0	3.80	
Horse Cove	71	21	47.0	8.14	
Hot Springs	75	26	48.9	.....	.....
Jefferson	73	18	43.2	4.65	T.
Kinston	79	27	51.8	5.04	
Kittyhawk	76	32	49.2	5.30	
Lenoir	77	22	47.5	4.20	
Linville	70	14	40.1	7.04	1.0
Littleton	77	20	46.8	4.68	
Louisburg	81	24	51.0	5.19	T.
Marion	78	22	49.2	7.04	
Marshall	76	22	48.7	4.84	0.3
Moncure	82	20	52.6	3.09	
Monroe	81	21	52.1	2.22	
Morganton	80	22	49.6	4.15	
Murphy				6.68	
Newbern	81	27	53.6	4.38	
Patterson k	76	22	43.9	3.62	
Pinehurst	83	25	54.1	2.43	
Pittsboro	84	20	52.2	3.60	
Reidsville	79	22	48.2	3.16	
Rockingham	85	26	54.2	2.13	
Salem	76	23	48.7	3.96	
Salisbury	82	25	52.8	2.60	
Saxon	77	20	46.4	3.25	
Selma	80	26	52.0	4.38	
Settle	80	24	50.7	2.41	
Sloan	83	28	55.2	3.79	
Soapstone Mount	78	21d	52.0	3.13	
Southern Pines a	84	25	54.6	2.75	
Southern Pines b	84	26	55.6	2.31	
Southport	76	28	54.2	4.11	
Springhope	81	26	52.1	2.95	
Statesville	81	22	50.8	2.46	
Tarboro	82	26	51.5	4.09	
Washington	83	26	53.8	6.12	T.
Waynesville	74	20	47.8	5.00	
Weldon a	82	24	48.3	3.95	
Weldon b				3.91	
Whiteville	83	25	56.5	4.99	
North Dakota.					
Amenia	46	— 5	21.4	0.82	6.6
Ashley	50	—14	29.7	0.71	4.5
Berlin	51	—16	29.6	0.82	6.0
Bottineau	40	—18	11.8	1.00	10.0
Buxton	44	—16	20.6	1.47	14.4
Churchs Ferry	40	—15	11.8	1.85	15.0
Coalharbor	42	—14	17.3	1.85	17.5
Devils Lake	42	—17	16.6	1.29	12.9
Dickinson	44	—12	19.6	2.02	14.7
Donnybrook	46	—10	12.1	1.70	17.0
Dunseith	41	—26	12.6	1.80	13.0
Edgeley	55	— 8	23.0	1.19	8.8
Ellendale	55	—10	24.4	0.30	3.0
Fargo	55	—17	19.1	0.95	7.2
Forman	50	—16	22.6	0.78	8.6
Fort Yates	64	— 9	23.4	1.13	6.5
Fullerton	56	—12	22.6	1.06	8.9
Glenullin	44	— 8	19.6	1.17	11.7
Grafton	40	—11	16.8	1.38	9.8
Hamilton	45	—15	15.6	2.19	21.9
Hannaford	50	—16	18.0	1.16	11.1
Jamestown	51	—11	20.7	1.26	8.4
Kulm	55	—10	22.4	0.69	4.0
Larimore	40	—12	18.5	1.52	10.0
Lisbon	48	—15	20.2	1.30	11.0
McKinney	45	—22	10.0	1.50	15.0
Manfred	41	—20	16.2	2.06	16.2
Medora m	58	— 5	21.0	.....	
Melville	45	—14	19.6	0.80	8.0
Minnewaukon	42e	—19e	16.6e	1.29	12.9
Minot	46	—10	17.5	1.70	17.0
Minto	41	—13	15.8	1.80	9.0
Napoleon	44	— 8	19.5	0.83	6.0
New England	45	— 7	19.4	1.40	14.0
Oakdale	48	— 9	17.7	2.12	21.2
Palermo	38	—10	16.3	1.93	19.6
Park River	49	—13	17.8	1.94	19.4
Pembina	44	—16	13.4	2.24	22.4
Portal	38	—14	11.7	0.71	7.1
Power	48	—13	21.9	0.82	7.9
Steele	46	—14	18.4	1.08	7.8
University	48	—14	20.8	1.08	7.8
Wahpeton	56	— 8	26.8	1.03	9.2
Willow City	41	—29	10.6	1.00	10.0
Ohio.					
Akron	74	11	37.0	4.55	0.5
Atwater				5.25	0.5
Bangorville	74	11	38.2	6.56	1.0
Bellefontaine	72	15	38.4	8.14	2.0
Benton Ridge	74	16	38.8	5.26	5.3
Bladensburg	76	14	39.3	5.87	0.4
Bowling Green	71	15	36.8	5.21	5.5
Bucyrus	74	13	38.8	1.85	.....
Cadiz	78	14	40.4	5.03	1.3
Cambridge	79	15	42.0	4.70	2.0
Camp Dennison	78	17	44.2	7.46	0.1
Canal Dover	75	15	39.8	6.89	1.0
Canton	73	14	37.8	6.07	1.7
Cardington	73	15	38.9	7.04	0.3
Circleville	89	18	42.3	5.80	T.
Clarington	81	24	44.9	5.41	1.0
Clarksville	79	17	44.0	7.19	0.8
Cleveland a	73	14	36.6	4.51	3.7
Cleveland b	74	13	35.2	3.77	3.0
Clifton	75	15	41.0	7.35	0.5
Coalton	81	17	44.8	5.09	1.0
Colebrook				5.14	.....
Dayton a				5.31	2.5
Dayton b	76	19	41.8	7.90	0.7
Defiance	69	14	36.5	6.30	7.7
Delaware	75	15	39.8	6.26	1.0
Demos	77	14	42.4	4.07	.....
Elyria	73	16	36.7	.....	.....
Findlay	75	15	39.8	5.84	3.0
Frankfort	79	18	44.4	5.54	2.5
Fremont	73	15	37.9	5.20	4.5
Garrettsville	75	3	35.8	5.23	2.8
Granville	77	15e	41.4	5.79	1.5
Gratiot	76	15	41.5	5.07	1.1
Green	81	19	46.2	8.84	0.3
Greenfield	76	20	43.3	6.02	2.0
Greenhill	74	10	37.0	5.28	1.2
Greenville	69	17	39.7	7.84	1.0
Hanging Rock	81	15	47.0	5.97	1.2
Hedges	72	17	38.6	6.14	3.0
Hillhouse	73	— 1	33.0	5.83	7.0
Hiram	72	5	35.2	3.73	2.0
Hudson	71	4	35.6	4.31	1.5
Jacksonboro	73	21	41.9	7.35	.....
Kenton	73	15	37.7	6.93	2.3
Killbuck	75	11	38.4	6.95	1.0
Lancaster	78	16	41.4	5.27	1.0
Lima	71	11	38.1	8.03	3.0
McConnelsville	79	15	41.7	5.32	1.5
Manara	77	16	42.3	5.09	1.0
Mansfield				7.88	4.8
Marietta	79	19	44.6	4.35	0.1
Marion	75	13	39.0	7.81	0.8
Medina	75	10	36.8	4.61	T.
Milfordton	73	12	38.4	7.03	2.0
Milligan	80	12	41.8	5.09	1.0
Millport	75	10	37.6	4.70	0.2
Montpelier	67	15	35.0	4.81	15.0
Napoleon	70	16	37.0	4.24	8.0
Nellie	78	18	40.6	5.62	0.5
New Alexandria	77	13	40.6	5.80	2.0
New Berlin	73	8	37.2	4.83	T.
New Bremen	71	16	39.9	7.51	2.5
New Richmond	77	18	44.6	6.51	1.3
New Waterford	75e	10	38.5	4.39	T.
North Lewisburg	75	14	39.4	6.60	3.0
North Royalton	73	4	35.0	5.16	2.0

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Norwalk	77	13	37.8	5.73	3.0
Oberlin	77	14	37.4	4.22	T.
Ohio State University	69	16	39.0	5.29	1.1
Orangeville	75	5	37.6	2.96	1.0
Ottawa	73	16	38.8	6.37	5.0
Pataskala	78	15	40.6	5.49	1.0
Philo	80	14	41.8	2.44	1.1
Plattsburg	73	15	40.0	6.46	1.0
Pomeroy	80	18	44.8	5.00	1.0
Portsmouth *a*	.....	.....	.....	5.71	0.5
Portsmouth *b*	80	20	46.2	6.92	0.5
Pulse	76	18	44.6	6.31	1.0
Richwood	74	16	39.2	7.16	1.8
Rockyridge	72	12	36.8	4.14	4.5
Shenandoah	73	12	36.2	6.83	1.7
Sidney	73	18	40.8	8.06	1.5
Somerset	78	16	41.8	3.57	1.4
Springfield	...	.....	.....	8.05	4.9
Thurman	86	16	45.8	4.67	1.0
Tiffin	73	14	38.2	5.98	5.2
Upper Sandusky	74	15	39.0	5.68	3.5
Urbana	66	16	38.0	6.09	1.0
Vickery	72	9	37.4	4.75	5.7
Warren	75	10	36.2	5.59	1.2
Wauseon	69	14	35.2	6.30	13.3
Waverly	83	17	44.6	5.90	0.4
Waynesville	75	16	42.0	6.38	.....
Wellington	77	15	38.0	4.12	2.0
Willoughby	.....	.....	.....	5.38	.....
Wilson	79	15	44.2	6.14	1.5
Wooster	74	13	37.6	6.22	1.0
Zanesville	.....	.....	.....	4.63	0.7
Oklahoma.					
Arapaho	91	16	56.8	0.20	
Beaver	92	1	51.0	0.00	
Binger	91	10	57.1	0.13	
Chandler	90	10	56.0	0.32	
Cleo	96	11	57.6	T.	
Cloud Chief	92	15	56.5	0.44	
Eldorado	96	21	61.3	0.00	
Enid	89	11[f]	55.0[e]	0.55	
Fort Reno	93	16	57.8	0.02	
Fort Sill	96	16	60.0	T.	
Guthrie	90	18	57.4	T.	
Harrington	88	16	56.2	0.23	
Hennessey	90	16[g]	56.4[d]	0.95	
Hobart *b*	92	26	59.0	0.35	
Jefferson	86	18	52.1	0.87	
Jenkins	90	15	53.8	1.20	
Kenton	80	14	48.4	0.26	1.0
Kingfisher	90	15	57.7	0.16	
McComb	93	15	59.0	0.39	
Mangum	90	20	58.3	0.40	
Meeker	96	12	58.2	0.50	
Newkirk	85	16	55.4	1.09	
Norman	92	15	59.2	0.13	
Perry	91	17	55.8	0.38	
Sac and Fox Agency	91	14	50.6	0.50	
Shawnee	92	21	55.8	0.37	
Stillwater	91[i]	15[i]	53.2[i]	0.15	
Taloga	90	11	53.1	T.	
Temple	94	19	61.6	0.07	
Watonga	96	11	58.4	T.	
Waukomis	92	18	57.8	0.40	
Weatherford	89	17	54.6	0.06	
Whiteagle	90	18	55.2	1.16	
Woodward	85	12	53.0	1.00	T.
Oregon.					
Albany	.....	.....	.....	9.30	T.
Alpha	62	27	42.6	21.64	11.8
Arlington	65	27	42.6	1.93	
Ashland	63	24	42.8	4.18	6.2
Astoria	58	30	42.2	13.82	3.0
Aurora (near)	61	25	42.2	8.37	0.2
Bay City	54	27	41.7	17.42	2.2
Bend	54	11	36.8	3.30	14.5
Beulah	56	19	38.5	1.84	5.0
Blackbutte	53	30	38.2	10.57	14.0
Blalock	64	29	44.6	1.69	0.5
Bullrun	.....	.....	.....	15.45	9.0
Burns	56	12	33.8	2.88	11.0
Burns (near)	.....	.....	.....	3.56	15.0
Butter Creek	.....	.....	.....	2.06	.....
Cascade Locks	58	28	41.1	15.09	
Coquille	.....	.....	.....	16.60	
Corvallis	59	28	42.8	11.70	T.
Dayville	63	20	42.0	3.11	6.0
Detroit	74	.....	.....	16.10	21.5
Doraville	59	25	39.8	8.31	5.6
Drain	66	31	45.9	13.71	.....
Ella	.....	.....	.....	2.11	T.
Eugene	61	30	43.6	10.49	1.3
Fairview	65	30	44.9	20.32	3.5
Falls City	58	26	40.5	21.27	7.6
Forestgrove	60	27	42.3	11.62	
Gardiner	71	30	46.5	24.21	
Glenora	54	24	38.6	19.26	26.5
Government Camp	45	6	29.4	12.01	82.0
Oregon—Cont'd.	°	°	°	*Ins.*	*Ins.*
Grants Pass	69	27	43.8	11.17	1.8
Hood River (near)	59	25	39.4	6.70	10.9
Huntington	57	22	39.4	4.54	4.0
Jacksonville	70	27	46.4	7.59	5.0
Joseph	54	7	32.3	2.85	16.5
Kerby	58	28	41.4	26.47	46.5
Klamath Falls	60	11	35.3	3.62	4.2
Lagrande	58	14	37.2	4.01	5.0
Lakeview	55	12	32.0	4.53	.....
Langlois	63	.....	.....	25.07	
Lonerock	61	14	37.[24]	3.47	6.5
McKenzie Bridge	66	24	39.1	15.23	.....
McMinnville	58	28	42.6	10.09	2.5
Meacham	.....	.....	.....	5.35	33.5
Monroe	61	27	43.2	13.79	T.
Mount Angel	61	32	43.1	8.00	1.5
Nehalem	.....	.....	.....	17.14	1.0
Newport	70	31	44.6	13.37	
Ontario	.....	.....	.....	3.57	1.0
Pendleton	75	20	44.0	2.77	
Pine	53	11	33.9	4.63	9.0
Prineville	60	17	37.9	2.14	
Riverside	60	12	39.8	0.60	1.5
Salem	58	29	43.6	9.04	
Sparta	49	11	31.4	5.37	26.0
Stafford	60	26	42.0	9.85	0.5
The Dalles	65	28	43.0	3.10	3.5
Toledo	58	27	41.6	17.03	1.0
Umatilla	65	28	44.3	1.64	T.
Vale	61	21	40.2	3.71	1.5
Wallowa	54	10	34.6	3.14	10.0
Wamic	57	11	36.7	4.53	14.5
Warm Spring	62	22	41.6	3.46	6.5
Weston	61	17	36.6	8.02	13.0
Williams	66	26	43.8	10.88	15.2
Pennsylvania.					
Aleppo	78	14	42.6	5.99	1.0
Altoona	70	12	34.5	4.12	.....
Beaver Dam	.....	.....	.....	7.02	.....
Bellefonte	68	13	35.4	5.13	5.0
Brookville	.....	.....	.....	6.89	2.4
Browers	.....	.....	.....	4.10	.....
California	79	18	43.0	4.82	0.4
Cassandra	72	10	34.5	3.58	7.0
Centerhall	63	10	34.2	4.91	7.0
Clarion	.....	.....	.....	6.46	5.3
Coatesville	65	14	37.6	3.74	6.2
Coudersport	64	3	30.8	4.60	3.0
Confluence	.....	.....	.....	4.18	1.0
Davis Island Dam	.....	.....	.....	5.38	.....
Derry	78	14	40.4	5.26	T.
Doylestown	.....	.....	.....	4.26	.....
Dushore	57[f]	— 2[f]	30.0[f]	3.26	6.5
East Bloomsburg	.....	.....	.....	2.65	0.4
East Mauch Chunk	59	7	34.6	5.64	9.5
Easton	62	12	36.3	3.22	6.6
Ellwood Junction	.....	.....	.....	5.24	0.5
Emporium	66	9	34.0	6.18	6.5
Ephrata	63	9	36.6	2.61	5.7
Everett	76	14	36.5	2.97	2.0
Forks of Neshaminy	.....	.....	.....	3.96	.....
Franklin	77	5	35.6	3.75	1.0
Freeport	76	14	39.2	6.05	0.6
Gettysburg	72	17	40.5	3.04	3.5
Girardville	.....	.....	.....	5.39	12.0
Gordon	60	8	34.5	4.49	4.0
Grampian	68	0	32.0	6.06	3.0
Greensboro	.....	.....	.....	4.60	0.5
Greenville	74	6	36.0	4.37	2.2
Hamburg	61	10	36.2	3.57	8.5
Herrs Island Dam	.....	.....	.....	5.44	.....
Huntingdon *a*	.....	.....	.....	3.82	2.0
Huntingdon *b*	71	15	37.2	4.00	1.8
Indiana	72	10	37.3	6.12	3.1
Irwin	78	14	40.9	4.93	T.
Johnstown	80	14	38.7	5.57	2.6
Keating	.....	.....	.....	4.80	4.9
Kennett Square	67	15	38.0	4.17	8.7
Lansdale	.....	.....	.....	3.55	.....
Lawrenceville	60	2	31.4	2.60	4.0
Lebanon	63	15	37.2	3.50	5.5
Leroy	59	4	30.8	3.94	6.5
Lewisburg	64	11	35.8	3.75	8.0
Lockhaven *a*	63	13	36.2	4.99	8.0
Lockhaven *b*	.....	.....	.....	5.38	9.0
Lock No. 4	.....	.....	.....	5.68	.....
Lycippus	77	12	39.6	5.00	2.9
Marion	71	17	38.2	2.34	2.0
Mifflin	.....	.....	.....	3.25	.....
Mifflintown	64[d]	15	36.2	3.12	4.0
Milford	62	2	32.8	3.40	9.1
Montrose	57	1	29.6	2.42	10.0
New Germantown	71	11	37.2	3.16	2.8
Oil City	.....	.....	.....	6.10	2.2
Ottsville	.....	.....	.....	3.11	.....
Parker	.....	.....	.....	6.08	3.0
Philadelphia	68	18	40.3	3.78	4.4
Pocono Lake	57	0	28.9	4.64	8.0
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Point Pleasant	.....	.....	.....	3.68	.....
Pottsville	.....	.....	.....	4.83	.....
Quakertown	64	12	36.2	3.02	7.5
Reading	64	15	38.5	3.15	.....
Renovo	65	13	35.2	5.17	7.0
Saegerstown	71	3	35.0	6.46	2.0
St. Marys	60	6	30.1	4.25	6.0
Saltsburg	.....	.....	.....	5.44	0.5
Seisholtzville	.....	.....	.....	3.52	.....
Selinsgrove	62	9	37.6	3.36	5.0
Shawmont	.....	.....	.....	3.23	.....
Skidmore	74	4	37.1	4.15	T.
Smethport	62	2	30.6	3.55	5.0
Smiths Corners	.....	.....	.....	3.21	.....
Somerset	76	10	36.0	5.10	3.1
South Eaton	55	7	34.4	2.56	3.0
Springmount	.....	.....	.....	3.16	.....
State College	64	11	33.2	4.04	3.4
Swarthmore	68	15	38.5	3.20	13.0
Towanda	62	2	32.6	2.73	7.5
Troutrun	.....	.....	.....	3.88	9.0
Uniontown	80	18	41.2	4.32	1.5
Warren	67	6	33.5	5.94	5.0
Wellsboro	59	9	32.6	.....	6.5
Westchester	65	15	37.7	4.31	6.8
West Newton	.....	.....	.....	4.63	.....
Wilkesbarre	62	11	35.0	3.62	10.5
Williamsport	66	13	36.4	5.11	5.5
York	66	12	38.4	2.93	9.1
Rhode Island.					
Bristol	56	9	34.5	2.21	4.5
Kingston	60	5	32.8	2.88	6.0
Pawtucket	64	10	35.2	1.76	5.0
Providence *a*	68	10	35.8	3.92	8.0
Providence *c*	66	6	34.4	3.44	5.0
South Carolina.					
Aiken	83	29	58.4	3.40	
Allendale	82	33	59.9	4.75	
Anderson	80	27	54.7	5.76	
Barksdale	81	26	54.0	2.70	
Batesburg	82	25	55.2	4.13	
Beaufort	80	36	60.9	2.44	
Bennettsville	82	30	56.4	2.86	
Blackville	87	31	58.2	4.11	
Bowman	84	30	59.0	3.77	
Calhoun Falls	.....	.....	.....	2.49	
Camden	.....	.....	.....	3.61	
Cheraw *a*	81	28	53.7	3.50	
Cheraw *b*	.....	.....	.....	4.02	
Clarks Hill	81	29	57.9	3.42	
Clemson College	84	24	53.8	4.77	
Conway	84	28	56.6	4.68	
Darlington	84	27	57.3	2.47	
Dillon	84	27	57.2	2.60	
Due West	79	27	54.8	3.33	
Effingham	.....	.....	.....	3.46	
Florence	85	27	55.2	2.23	
Gaffney	85	25	51.6	3.43	
Gillisonville	83	32	61.3	4.75	
Greenville	78	23	49.1	3.99	
Greenwood	79	29	52.8	2.68	
Heath Springs	77	36	54.0	2.72	
Kingstree *a*	82	31	56.4	4.20	
Kingstree *b*	.....	.....	.....	4.22	
Liberty	81	25	52.6	4.34	
Little Mountain	83	29	56.4	1.99	
Lugoff	85	26	57.9	1.57	
Newberry	81	26	55.7	3.18	
Pinopolis *[j]*	76	35	57.7	4.00	
St. Georges	81	34	57.2	3.84	
St. Matthews	80	32	56.2	4.32	
St. Stephens	.....	.....	.....	3.50	
Saluda	83	26	56.6	2.35	
Santuck	82	23	53.4	3.03	
Seivern	83	26	58.2	3.23	
Smiths Mills	.....	.....	.....	5.51	
Society Hill	80	29	55.6	2.60	
Spartanburg	82	25	50.8	5.09	
Statesburg	82	30	58.7	3.80	
Summerville	84	31	59.6	3.92	
Trenton	81[h]	28[c]	56.6[h]	2.89	
Trial	83	28	58.6	2.34	
Walhalla	79	24	52.6	5.52	
Walterboro	86	32	61.7	5.38	
Winnsboro	82	31	56.8	2.08	
Winthrop College	80	26	54.0	2.76	
Yemassee	85	34	59.5	3.26	
Yorkville	85	27	54.4	2.58	
South Dakota.					
Aberdeen	55	—14	25.4	2.52	11.2
Academy	66	2	33.8	0.36	3.0
Alexandria	64	— 3	33.2	0.68	T.
Armour	76	— 1	33.7	0.32	
Ashcroft	56	— 4	28.6	0.65	6.5
Bowdle	54	—13	24.0	0.60	6.0
Brookings	62	— 6	29.3	0.25	
Canton	62	— 1	33.8	0.44	2.0
Cavite	68	1	35.0	0.03	0.3

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Dakota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Centerville				0.61	0.7
Chamberlain	68	1	34.9	0.05	0.8
Cherrycreek	65	— 9	31.5	0.07	0.7
Clark	59	—11	27.0	0.45	2.0
Clear Lake	58	— 9	26.5	0.11	T.
Desmet	62	—10	29.4	0.10	
Doland	63	—12	28.2	0.80	2.7
Elkpoint	66	2	35.4	1.43	7.5
Fairfax	70	6	37.6	T.	
Farmingdale				0.16	T.
Faulkton	62	— 8	27.4	0.02	T.
Flandreau	66	— 5	30.2	0.28	T.
Forestburg	66	— 9	30.5	0.10	T.
Fort Meade	64	— 1	33.3	0.31	T.
Gannvalley	65	— 8	32.6	0.27	1.0
Grand River School	53	1	26.9	0.27	3.8
Greenwood	66	2	36.8	0.17	0.5
Highmore	64	— 7	30.4	0.05	0.5
Hotch City	66	— 1	32.8	0.06	2.0
Howard	64	4	31.4	0.28	T.
Howell	64	— 9	28.6	0.17	1.1
Ipswich	58	— 9	25.5	0.61	
Kidder	59	— 2	24.2	1.21	6.5
Kimball	66	— 1	31.8	0.35	3.0
Leola	55	—18	25.2	1.50	7.3
Marion	61	— 1	32.8	0.50	
Mellette	55	—13	25.4	0.20	2.0
Menno	64	— 2	33.4	0.37	0.5
Millbank	55	— 8	29.0	0.67	
Mitchell	65	— 3	33.7	0.33	
Oelrichs	70[1]	— 3[1]	34.1[1]	0.90	4.0
Pedro	65	2	31.2	T.	T.
Pine Ridge	72	— 7	37.5	0.32	2.2
Plankinton	65	— 3	32.0	0.08	T.
Ramsey	62	— 7	31.6	T.	
Redfield	63	— 9	27.2	0.43	4.2
Rosebud	70	0	36.9	0.30	3.5
Silver City				0.33	T.
Sioux Falls	64	— 6	32.5	0.28	
Sisseton Agency	54	— 9	24.4	0.61	3.9
Spearfish	70	0	33.0	0.08	1.0
Stephan	65	— 9	29.9	0.05	0.5
Tyndall	67	1	35.3	0.50	
Vermillion	65	2	35.9	0.91	3.0
Watertown	58[b]	—10[c]	25.9[b]	0.10	1.0
Wentworth	73	—12	30.0	0.23	
Wolsey				0.15	1.3
Tennessee.					
Andersonville	76	20	51.5	5.32	T.
Ashwood	80	24	52.3	5.85	
Bluff City				5.16	
Bolivar	81[c]	24	51.4[c]	6.53	
Bristol	74	20	47.5	3.10	T.
Brownsville	79	26	53.6	6.68	
Byrdstown	80	20	49.8	5.42	2.0
Carthage	76	23	52.2	7.14	
Catlettsburg				6.03	
Cedar Hill	81	23	50.3	6.50	
Celina				5.29	
Charleston				6.28	
Clarksville	80	23	50.2	5.53	0.2
Clinton				6.98	
Covington	80	28	54.0	6.50	
Decatur	76	22	51.4	7.10	
Dickson	79	21	50.9	6.67	
Dover	81	23	51.5	5.55	
Dyersburg	80	26	50.4	5.70	
Elizabethton	72	28	50.0	6.07	T.
Erasmus	74	15	47.0	9.51	T.
Florence	80	23	51.4	6.37	
Franklin	83	24	51.2	5.46	
Grace				9.30	
Greeneville	79	23	49.9	5.69	T.
Halls Hill				7.24	
Harriman	74	25	50.4	6.70	
Hohenwald	80	19	50.7	6.85	
Iron City	83[d]	23	53.6	7.53	
Isabella	73	24	50.2	7.23	
Jackson	80	22	53.4	5.51	
Johnsonville	80	23	52.4	5.64	
Jonesboro	75	23	49.0	6.29	T.
Kenton	81	24	52.2	5.06	
Kingston				6.81	
Lafayette	77	19	48.6	7.49	
Leadvale				5.70	
Lebanon	83[c]	21[d]	50.0[d]	6.01	
Lewisburg	82	24	52.8	7.57	
Liberty				6.80	0.1
Lynnville	80	24	51.6	7.10	T.
McKenzie[f]	79	23	52.2		
McMinnville	82	20	52.0	6.72	T.
Maryville	79	24	52.0	6.80	T.
Newport	81	25	51.0	6.16	
Palmetto	80	22	52.0	6.95	
Pope	82	20	53.3	5.78	
Rogersville	83	22	50.8	5.43	T.
Rugby	73	13	47.2	7.92	T.
Savannah	81	25	54.8	6.35	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
Sewanee	77	18	49.2	10.08	
Silverlake	74	18	45.0	4.98	0.5
Springdale	79	19	50.0	4.52	T.
Springville	80	22	51.8	6.30	T.
Tazewell				5.14	T.
Tellico Plains	79	25	53.6	6.60	T.
Tracy City	78	19	49.6	8.90	
Trenton	81	27	52.9	5.70	
Tullahoma	80	22	52.0	9.25	T.
Waynesboro	80	23	52.2	6.98	
Wildersville	79	25	54.1	5.70	
Yukon	80	23	53.2	6.08	
Texas.					
Albany	96	29	64.4	0.00	
Alvin	85	38	67.2	0.87	
Arthur				6.02	
Athens	94	31	63.4		
Austin[a]	92	32	66.4	0.13	
Ballinger	94	25	63.0	0.00	
Beaumont	86	47	69.9	1.58	
Beeville	99	37[e]	72.0[d]	0.04	
Bigspring	90	29	63.2	0.00	
Blanco	90[c]	30	63.5	1.06	
Boerne[•1]	97	29	64.4	0.88	
Bonham	93	25	64.4	3.97	
Booth				1.40	
Bowie	94	22	63.2	0.07	
Brazoria	84[c]	40	66.8	0.70	
Brenham	90	33	66.4	0.22	
Brighton	82	39	67.8	0.17	
Brownwood	95	30	61.0	1.00	
Burnet	94	27	66.1	0.75	
Camp Eagle Pass	105	32	72.0	0.00	
Childress	98	22	61.9	T.	
Claytonville	90	21	63.4	0.00	
Coleman	95	26	65.0	0.15	
College Station	91	31	66.8	0.41	
Colorado	92	21	63.6	0.00	
Columbia	85	33	66.8	0.47	
Columbus				T.	
Comanche	95[c]	20[c]	63.2[c]	0.83	
Comstock	100	34	69.4	0.00	
Corsicana	95	29	63.1	0.50	
Cotullo	106	41	78.3	0.36	
Cuero	92	37	67.3	0.09	
Dallas	93	24	60.4	2.36	
Danevang	87	33	66.2	0.50	
Dialville	88	28	63.8	3.63	
Dublin	88[b]	31[b]	66.2[f]	1.00	
Duval	92	31	68.7	1.02	
Estelle	93	24	63.6	4.45	
Fort Brown	90	46	72.9	0.04	
Fort Clark	98	35	69.0	0.00	
Fort Davis	84	28	58.0	0.00	
Fort McIntosh	105	37	75.5	0.05	
Fort Ringgold	105	42	77.1	1.20	
Fort Stockton				0.00	
Fredericksburg	93[1]	29[1]	67.1[1]	1.37	
Gainesville	92	21	60.4	4.62	
Gatesville	97	22	68.1	1.58	
Graham	96[1]	29[c]	66.0[f]	0.04	
Grapevine	92	24	64.0	3.75	
Greenville	91	26	61.9	2.85	
Hale Center	85	21	56.8	0.00	
Hallettsville	90	36	68.5	0.60	
Haskell	96	23	63.0	0.00	
Hearne	95	44	73.8	0.12	
Henrietta	97	21	62.3	T.	
Hewitt				1.05	
Hillsboro	90	26	64.0	2.74	
Hondo	96	32	67.2	0.16	
Houston	89	40	66.1	2.66	
Huntsville	90	33	65.5	0.58	
Ira	92	24	61.8	0.00	
Jasper	88[f]	36[f]	67.4[f]	2.00	
Jefferson	85	28	62.5		
Jewett	89	28[1]	66.0[c]	0.71	
Junction				0.00	
Kaufman	90	26	65.1	3.90	
Kent	84	24	60.6	0.00	
Kerrville	92	27	69.8	0.00	
Knickerbocker	93	22	65.4	0.00	
Kopperl				1.75	
Lampasas	94	27	63.5	0.20	
Lapara				0.30	
Liberty				0.07	
Llano	96	40	65.2	0.35	
Longview	89	30	61.6	2.04	
Luling	94	30	65.9	0.45	
McKinney	86	32	62.8	3.41	
Mann	92	30	66.4	1.54	
Marlin	93	28	63.4	1.58	
Menardville	93	20	63.2	0.46	
Midland	87	26	56.1	0.00	
Mount Blanco	89	21	57.0	0.02	
Nacogdoches	90	31	62.7	3.23	
New Braunfels	94	35	68.4	0.43	
Orange				2.05	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Panter				1.36	
Paris	93	27	58.4	3.17	
Pearsall	100	35	71.6	0.00	
Pecos	93	36	64.7	0.00	
Port Lavaca	83	40	67.5	0.81	
Rhineland	94	18	58.6	0.00	
Riverside				2.78	
Rockisland	89[c]	35[b]	67.0[c]	0.09	
Rockland				3.00	
Rockport	74	48	64.9	1.50	
Runge	98[c]	34[c]	70.0[c]	0.62	
Sabinal	104	30	70.5	0.00	
San Saba	98	24	65.6	0.36	
Santa Gertrudes Ranch				0.61	
Sherman	89	29	62.3	4.30	
Sonora	93	25	64.7	T.	
Sugarland	86	33	65.1	0.92	
Sulphur Springs	90	26	62.6	5.19	
Temple[a]	90	27	61.2	0.34	
Temple[b]	91	28	62.8	0.36	
Tilden	104	26	70.4	T.	
Trinity	90	30	66.5	0.61	
Tulia	85	16	53.6	0.00	
Tyler	89	29[c]	63.2[c]	2.38	
Victoria	89	36	66.8	0.10	
Vernon				0.00	
Waco	95	31	64.4	1.17	
Waxahachie	94	23	61.0	2.13	
Weatherford	93	25	61.8	0.97	
Wichita Falls				0.00	
Utah.					
Alpine				5.15	
Aneth	75	14	47.3	0.10	
Blackrock	76	11	42.4	0.93	3.0
Bluecreek	52	27	39.2	1.15	2.0
Callao	75	11	42.4	1.16	2.5
Castledale	78[b]	2[b]	39.3[c]	0.45	
Cisco	74	12	46.0	0.81	2.0
Corinne	65	14	38.3	4.15	11.0
Coyoto	61	0	37.4	0.05	0.5
Deseret	70	11	40.2	1.55	
Emery	65	11	34.8	T.	
Escalante	69	17	42.7	1.55	
Experiment Farm	78	24	51.6		
Farmington	61	16	40.2	5.26	36.0
Fillmore	70	14	42.4	2.16	
Fort Duchesne	82	9	40.4	1.10	5.7
Frisco	67	11	40.4	0.97	
Garrison	71	14	42.3	0.62	T.
Giles	70	8	40.4	1.10	
Government Creek	75	5	38.9	4.94	15.5
Grover	69	10	39.5	0.35	3.5
Heber	62	10	35.8	3.48	
Henefer	61	9	34.9	4.61	12.8
Hite	78	20	51.7	0.45	
Huntsville				6.34	26.0
Ibapah	67	11	37.4	1.49	7.5
Kanab	74	10	39.5	1.01	
Levan	65	15	38.0	3.25	11.1
Loa	69	0	37.5	0.80	8.0
Logan	60	10	36.5	3.13	
Lund	73	12	42.4	1.90	3.1
Manti	65	13	39.1	1.71	
Marysvale	67	8	39.8	1.99	13.0
Meadowville	49	6	30.0	4.50	16.5
Millville				4.02	
Moab	79	18	48.8	0.90	0.5
Monticello	71	20	48.9	1.53	17.0
Morgan	61	8	35.6	5.07	
Mount Nebo	61	16	41.1	2.83	5.0
Mount Pleasant	65	12	38.4	2.20	
Ogden	60	17	39.0	6.54	17.2
Park City	59	7	34.6	7.85	7.8
Parowan	70	8	41.7	2.11	18.1
Pinto	67	1	38.3	1.72	
Plateau	62	— 4	35.8	2.54	23.9
Promontory •[1]	58	20	35.5	0.55	4.5
Provo	67	15	40.8	3.75	9.0
Ranch	63	—10	35.4	3.99	
Richfield	71	8	41.8	0.16	0.5
Rockville	86	23	54.0	1.02	
St. George	86	20	49.6	0.57	
Salt Air	60	22	40.5	2.73	
Scipio	78	12	40.3	3.21	13.0
Snowville	59	17	35.6	4.35	
Soldier Summit	55[j]	— 4[j]	27.3[j]	2.98[b]	29.8[b]
Terrace	61	18	37.4	0.60	1.0
Thistle	70	3	38.0		
Tooele	63	14	39.6	4.25	
Tropic	67	3	37.3	T.	
Wellington	70	5	36.7	0.55	0.5
Woodruff	55	— 2	30.0	2.65	14.0
Vermont.					
Burlington	53	3	29.3	1.00	3.0
Cavendish	57	—11	27.2	2.12	9.4
Chelsea	52	—10	24.4	1.93	12.0
Cornwall	57	0	29.4	1.56	4.5
Derby	53	—10	23.3	1.98	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Vermont—Cont'd.	°	°	°	*Ins.*	*Ins.*
Enosburg Falls	57	−14	27.6	2.46	6.5
Jacksonville	53	−15	26.3	2.84	9.0
Manchester	59	0	29.2	1.48	6.0
Morrisville	55	−18	26.3	2.53	6.2
Norwich	55	−13	21.8	2.35	8.0
St. Johnsbury	53	−16	26.9	1.26	6.2
Wells	56	0	27.3	1.79	2.5
Woodstock	58	−10	29.6	1.71	8.0
Virginia.					
Ashland	73	19	45.8	3.64	T.
Barboursville	72	17	45.8	4.10	T.
Bigstone Gap	77	21	49.8	5.20	T.
Blacksburg	76	13	42.2	2.43	T.
Buckingham	76	20	50.1	2.78	T.
Burkes Garden	69	11	40.0	3.67	1.0
Callaville	76	26	49.0	4.10	
Charlottesville	77	19	47.0	2.22	T.
Clarksville				2.15	T.
Columbia	74			3.80	T.
Dale Enterprise	75	16	42.7	2.43	3.0
Danville	75	22	50.4	2.95	T.
Elk Knob	73	20	47.1	5.12	T.
Farmville	75	20	48.8	3.10	
Fredericksburg	75	17	44.8	2.58	1.0
Hampton	76	26	47.2	4.09	
Hot Springs	74	11	41.2	3.65	
Lexington	78	19	46.4	2.29	T.
Lincoln		16			T.
Marion				4.35	
Mendota				4.32	T.
Mount Weather	65	9	37.4	2.26	T.
Newport News	74	25	49.9	3.35	T.
Petersburg	72	25	47.1	3.33	T.
Quantico	73	20	44.0		
Radford				0.92	
Riverton				1.22	
Roanoke				2.45	T.
Rockymount	67	19	41.4	2.36	
Saxe	77	19	48.8	2.85	T.
Shenandoah				2.05	0.1
Speers Ferry				5.16	T.
Spottsville	78	24	47.4	3.54	T.
Stanardsville	72	15	42.6	2.83	
Staunton	75	20	45.5	2.50	T.
Stephens City	79	16	42.4	2.23	T.
Warsaw	76	20	44.6	2.52	T.
Wilkerson	74	22	44.4	2.99	T.
Woodstock	76	19	43.7	1.86	T.
Wytheville	77	18	45.0	2.54	T.
Washington.					
Aberdeen	58	28	40.9	15.66	6.2
Anacortes				3.40	
Ashford				9.28	33.0
Bellingham	58	26	42.5	3.63	
Blaine	54	26	40.4	5.54	2.7
Brinnon	57	26	39.6	17.89	5.0
Cedonia	52	9	34.2	1.75	12.1
Centralia	62	26	41.9	8.23	4.0
Cheney	52	7	32.7	2.66	13.8
Clearbrook	59	25	40.0	5.31	3.0
Clearwater	69	28	41.4	18.33	10.5
Cle Elum	53	4	31.0	4.76	22.0
Colfax	60	14	37.7	5.05	
Colville	64	7	33.2	2.44	13.7
Conconully	51	3	31.6	3.47	29.3
Coupeville	58	27	42.0	3.15	2.5
Crescent	51	11	33.0	3.16	13.5
Danville	52	8	32.4	0.87	4.8
Dayton	64	23	40.0	5.46	
East Sound	54	22	40.0	4.80	1.7
Ellensburg	55	11	33.9	2.32	8.5
Ephrata	59	17	36.4	0.50	2.0
Grandmound	59	20	41.0	9.90	2.8
Granite Falls				9.87	4.0
Horseheaven				2.11	5.5
Kennewick	69	21	43.3	1.94	1.8
Lacenter	59	27	40.6	9.03	
Lakeside	54	15	35.2	3.15	18.0
Lester	60	15	37.8	3.80	14.0
Lind	58	24	38.6	2.63	8.5
Loomis	51	11	32.2	1.20	9.0
Mottinger Ranch	70	28	45.4	2.04	T.
Mount Pleasant	59	23[b]	41.1[4]	10.23	1.8
Moxee	62	18	38.2	0.76	3.8
Northport	50	3	31.1	2.10	21.0
Odessa	60	28[b]	38.8[4]	1.10	3.5
Olga	52	29	40.6	3.52	T.
Olympia	60	27	41.6	9.30	
Pinehill	61	23	40.0	4.96	10.0
Port Townsend	57	31	41.6	3.86	0.1
Pullman	58[e]	12[b]	35.4[e]	5.25	23.0
Rattlesnake	50	12	31.6	3.54	18.5
Republic	50	−4	29.6	2.20	12.5
Ritzville				2.03	4.0
Ritzville (near)				1.98	6.0
Rosalia	55	4	34.6	2.98	5.7
Sedro-Woolley	64	26	41.8	5.16	7.8
Silvana	59	25	39.8	4.25	1.5

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Washington—Cont'd.	°	°	°	*Ins.*	*Ins.*
Snohomish	58	25	41.2	7.46	T.
Snoqualmie	57	28	42.4	8.68	7.5
Southbend	60	29	40.8	12.88	8.2
South Ellensburg	54	14	33.2	2.68	18.0
Sprague				2.14	0.4
Sunnyside	66	23	41.2	1.49	3.8
Trinidad	58	13	38.2	1.04	6.0
Twisp	50	6	29.6	1.95	19.5
Union	59[e]	28[e]	40.6[e]	15.55	2.2
Usk	50	−3	31.6	4.14	21.8
Vancouver	62	28	43.1	7.69	
Vashon	58	30	41.9	5.83	
Waterville	48	3	27.4	2.75	19.0
Wenatchee (near)	56	12	35.4	3.56	34.5
Wilbur	57	11	33.0	1.63	
Zindel	64[e]	28[e]	46.4[e]	1.54	
West Virginia.					
Bayard	77	9	38.4	4.04	
Beckley	72	22	38.2		
Bens Run	82	17	44.2	6.10	2.0
Beverly	79	14	41.8	4.10	3.0
Bluefield	75	15	43.6		3.0
Buckhannon	81	16	43.2	4.61	
Burlington	82	14	40.7	2.03	3.0
Cairo	83	13	44.5	4.80	0.5
Central	82	16	43.5	3.37	2.0
Chapel	81	16	46.8	3.16	5.0
Charleston	82	18	50.0	3.54	1.0
Creston	84	18	45.3	4.87	0.5
Cuba	82	17	44.2	5.47	1.0
Elkhorn	77	17	46.6	3.95	3.0
Fairmont				4.91	0.5
Glenville	82	17	42.9	4.99	1.0
Grafton	81	17	44.2	5.36	1.6
Green Sulphur Springs	81	15	42.7	2.37	
Harpers Ferry				2.29	0.5
Hinton				2.48	1.0
Huntington	83	20	44.9	4.84	2.0
Leonard	71	10	38.4	1.42	
Lewisburg	75	15	43.2	2.83	T.
Lillydale	78	16	44.8	2.19	T.
Logan	86	22	51.4	5.12	1.0
Lost Creek	80	15	43.2	3.88	2.0
Mannington	78	18	44.4	5.14	0.8
Martinsburg	77	16	38.6	2.18	T.
Moorefield	83	14	44.8	1.38	3.5
Morgantown	80	17	43.2	4.32	1.5
Moundsville	79	18	44.7	4.75	0.4
New Cumberland	76	14	39.9	5.61	T.
New Martinsville	80	20	45.2	5.14	1.5
Nuttallburg	84	18	48.2	3.60	
Parsons	82	12[f]	41.6[e]	4.60	2.2
Philippi	82	14	44.4	4.03	2.0
Pickens	70	11	41.7	6.10	8.0
Point Pleasant	81	19	48.4	5.36	T.
Powellton	83	11	40.6	2.55	0.5
Princeton	78	17	43.8	6.10	5.0
Romney	84	15	42.0	2.20	1.5
Rowlesburg				5.16	3.0
Ryan	82	7	45.6	4.66	1.5
Southside	82	27	48.1	5.81	2.0
Terra Alta	88	10	42.6	5.96	7.0
Uppertract	80	15	43.1	1.95	
Valley Fork	82	16	45.9	4.49	4.0
Wellsburg	74	13	39.4	4.97	1.0
Weston				5.20	2.0
Wheeling *a*				2.39	0.5
Wheeling *b*	82	23	47.3	3.82	0.2
Williamson	80	21	46.4	4.00	
Wisconsin.					
Amherst	49	−9	26.7	1.04	2.0
Antigo	48[e]	−11	26.8[4]	0.90	5.5
Appleton	50	3	29.3	3.49	7.6
Appleton Marsh	53	−7	27.6	1.66	6.8
Ashland				1.64	
Barron	48	−16	25.2	1.14	5.9
Beloit	60	11	33.7	3.31	7.6
Brodhead	57	5	33.3	3.70	8.0
Burnett	50	5	29.4	3.05	11.0
Butternut	49	−24	21.9	2.05	18.8
Chilton	52	6	28.6	3.38	2.3
Citypoint	51	−5	26.0	0.67	7.0
Darlington	54	3	31.6	2.70	9.0
Dodgeville	48	7	31.8	1.90	14.0
Downing	47	−12	26.4	2.10	6.0
Easton	53	−3	28.8	1.79	8.0
Eau Claire	52	−4	28.6	1.65	4.5
Florence	43	−12	23.1	1.42	10.5
Fond du Lac	51	6	30.8	1.00	7.0
Grand Rapids	50	−14	25.3	2.03	7.0
Grand River Locks				3.74	9.7
Grantsburg	48	−21	24.9	0.65	6.5
Hancock	51	−6	27.4	1.96	5.0
Harvey	53	7	30.8	3.45	13.3
Hayward	47	−24	21.8	1.13	6.5
Hillsboro	53	−1	29.3	2.70	8.0
Koepenick	48	−18	24.0	1.80	15.0
Lancaster	56	5	31.4	3.29	10.5

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Wisconsin—Cont'd.	°	°	°	*Ins.*	*Ins.*
Madison	52	6	30.6	2.44	6.5
Manitowoc	45	3	29.6	3.66	13.2
Meadow Valley	51	−7	26.8	2.28	7.5
Medford	49	−13	26.2	1.30	9.0
Menasha				2.29	7.0
Minocqua	47	−22	23.2	2.17	4.5
Mount Horeb	50	3	29.6	4.15	10.2
Neillsville	50	−11	27.1	2.07	5.0
New London	48	−5	26.8	2.16	9.0
Oconto	49	−7	28.0	2.57	6.0
Osceola	48	−18	25.0	1.37	11.0
Oshkosh	50	2	28.5	2.34	
Pine River	49	−2	27.6	2.35	8.7
Portage	53	2	30.7	3.21	9.0
Port Washington	50	3	26.4	4.75	19.0
Prairie du Chien *a*	60	6	35.4	3.04	8.0
Prairie du Chien *b*				2.84	9.0
Prentice	44	−10	24.3	1.51	15.1
Racine	54	10	33.1	5.28	
Sheboygan	49	7	30.3	3.33	18.5
Spooner	45	−20	24.2	0.81	6.0
Stanley	47	−11	26.3	2.16	5.2
Stevens Point	45[e]	−14	26.6[e]	0.85	4.5
Valley Junction	55	−1	30.4	1.26	6.0
Viroqua	53	2	29.8	2.98	6.5
Washburn	49	−14	22.1	1.63	14.2
Watertown	52	5	30.2	4.03	17.8
Waukesha	53	7	30.8	3.54	14.7
Waupaca	48	−8	26.9	2.43	9.0
Wausau	46	−14	25.4	1.62	
Whitehall	55	−4	29.6	2.35	6.3
Wyoming.					
Afton	48	1	28.4	4.60	20.0
Alcova	62	1	35.4	0.87	8.8
Basin	68[e]	0[e]	36.3[e]	0.47	4.7
Battle	38	−6	18.4	9.10	81.0
Bedford	47	−13	26.0	4.93	23.6
Border	52	−17	25.6	2.52	
Buffalo	61	−4	32.0	0.68	3.8
Chugwater	66	−11	36.2	1.08	5.5
Daniel	46	−26	19.6	3.50	35.0
Embar	68	−6	32.8	1.82	13.0
Evanston	49	−6	27.8	2.60	8.5
Fontenelle	50	0	28.1	1.15	11.5
Fort Laramie	70	−5	38.8	0.60	0.5
Fort Washakie	64	0	35.0	1.90	16.5
Fourbear	57	−12	26.8	1.22	13.5
Griggs	62	−15	34.7	1.15	6.8
Hot Springs	65	−8	33.6	4.16	13.0
Hyattville	65	−13	36.6		
Kimball Ranch	60	−10	28.9	1.08	10.8
Laramie	57	−6	32.0	0.36	4.0
Leo	57	−4	31.8	0.74	5.0
Lolabama Ranch	50	−20	26.4	0.87	10.0
Lusk	68	−7	33.8	0.50	5.0
Marquette	55	−6	32.8	1.10	6.0
Moore	63	−3	35.9	0.80	
Moorcroft	60	−10	32.6	1.14	2.0
Phillips	67	−4	37.0	0.95	3.9
Pine Bluff	70	0	37.5	T.	T.
Rawlins	56	2	32.6	1.29	12.9
South Pass	43	−2	22.0	2.40	24.0
Thayne	46	−10	26.8	3.88	18.2
Wells	42	−19	19.9	3.83	50.6
Yellowstone Pk. (G.Can.)	42	−25	19.0	5.60	
Yellowstone Pk. (Lake)	45	−17	22.0	3.62	34.7
Yellowstone Pk. (L. Basin)	44	−11	25.0	4.06	40.5
Porto Rico.					
Adjuntas	86	50	68.2	9.96	
Aguirre	89	63	76.5	4.43	
Arecibo	86	54	69.6	4.15	
Barros	85	52	68.8	7.75	
Bayamon	95	60	77.6	4.30	
Caguas	87	50	71.6	9.29	
Canovanas	86	66	76.2	7.40	
Cayey	84	52	68.4	7.30	
Cidra	87	51	70.0	19.45	
Coamo	89	52	71.8	5.96	
Fajardo	87	64	76.4	4.96	
Guanica	88	57	73.4	4.88	
Hacienda Colosa	88	57	73.4	7.22	
Hacienda Josefa				6.11	
Hacienda Perla	87	64	76.0	11.23	
Humacao	84	69	76.6	8.44	
Isabela	84	62	73.2	4.68	
Juan Diaz	90	61	75.6	4.88	
La Isolina	87	60	71.8	10.04	
Lares	86	51	70.5	9.33	
Las Marias	90	60	74.0	17.74	
Manati	95	60	74.3	3.56	
Maunabo	90	61	76.4	10.91	
Mayaguez	88	59	73.5	10.45	
Morovis	84	57	70.8	8.85	
Ponce	88	61	75.0	5.09	
Rio Blanco	90	62	75.2	11.93	
Rio Piedras				4.06	
San German	91	61	76.0	4.93	
San Lorenzo	89	55	72.2	8.29	

TABLE II.—*Climatological record of voluntary and other cooperating observers. Late reports for February*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Porto Rico—Cont'd.	°	°	°	*Ins.*	*Ins.*
San Salvador	82	55	69.8	4.55	
Santa Isabel	86	61	74.6	2.76	
Vieques	87	59	73.1	3.76	
Yauco	83	60	73.8	6.30	
Mexico.					
Coatzacoalcos	99	58	76.2	1.58	
Durango	85	44	64.6	0.00	
Leon de Aldamas	85	47	65.0	0.55	
Vera Cruz	86	65	75.4	0.30	
New Brunswick.					
St. John	45	0	27.6	3.46	15.9
Isthmus of Panama.					
Alhajuela	97	68	83.4	0.59	
Bohio	.....	.....	.....	3.15	
Colon	.....	.....	.....	1.65	
Gamboa	.....	.....	.....	1.93	
La Boca	87	71	79.0	5.00	
West Indies.					
Columbia, Isle of Pines	89	56	75.0	2.74	
Late reports for February, 1904.					
Alaska.					
Fort Gibbon	18	—51	-16.1	0.55	13.5
Kenai	31	—27	5.8	0.29	3.5
Sunrise	31	—16	8.7	0.13	2.9
California.					
Kernville	.....	.....	.....	2.48	
Paso Robles	77	28	47.8	4.86	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Colorado.	°	°	°	*Ins.*	*Ins.*
Glenwood Springs	63	—14	31.4	0.54	T.
Florida.					
Plant City	87	32	65.3	4.52	
Idaho.					
Roosevelt	38	— 1	20.0	6.92	64.5
Illinois.					
La Salle	63[c]	—10[c]	21.0[d]	0.82	9.0
Minnesota.					
Rolling Green	38	—19	7.2	0.40	4.0
Missouri.					
Palmyra	66	— 6	24.0	0.79	4.8
Montana.					
Hamilton	52	8	32.6	0.41	6.5
St. Peter	47	—19	16.0	0.37	6.5
Springbrook	41	—30	5.8	0.39	3.9
New Jersey.					
Toms River	66	— 2	26.2	3.05	6.5
New Mexico.					
Arabela	79	11	48.6	T.	T.
New York.					
King Ferry	.....	.....	.....	2.00	11.4
North Carolina.					
Pinehurst	71	15	40.6	4.26	T.
Spring Hope	76	14	38.4	5.25	5.0
Utah.					
Escalante	69	2	36.4	0.38	3.0
Vermont.					
Chittenden	.....	.....	.....	1.74	.....
Wyoming.					
Hot Springs	65	— 6	25.6	0.25	2.5

EXPLANATION OF SIGNS.

[a] Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance "[n]" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

NOTE.—The following change has been made in the names of stations: Washington, Whatcom changed to Billingham.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of March, 1904.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	21	15	9	31	n. 75 w.	23
Portland, Me	11	24	9	32	s. 61 w.	26
Concord, N. H.†	13	7	5	15	n. 59 w.	12
Northfield, Vt	23	33	4	12	s. 39 w.	13
Boston, Mass	17	19	11	28	s. 83 w.	17
Nantucket, Mass	19	17	17	23	n. 72 w.	6
Block Island, R. I	18	16	17	26	n. 77 w.	9
Narragansett, R. I.*	8	10	11	12	s. 27 w.	2
New Haven, Conn	24	13	17	21	n. 20 w.	12
Middle Atlantic States.						
Albany, N. Y	22	22	11	21	w.	10
Binghamton, N. Y.†	11	6	11	10	n. 11 e.	5
New York, N. Y	22	14	20	24	n. 27 w.	9
Harrisburg, Pa	24	9	24	21	n. 11 e.	15
Philadelphia, Pa	31	14	18	18	n.	17
Scranton, Pa	23	21	10	22	n. 81 w.	12
Atlantic City, N. J	24	14	20	19	n. 6 e.	10
Cape May, N. J	29	12	16	14	n. 7 e.	17
Baltimore, Md	29	10	19	15	n. 12 e.	19
Washington, D. C	34	12	18	14	n. 10 e.	22
Cape Henry, Va.†	15	10	11	4	n. 54 e.	9
Lynchburg, Va	23	16	20	21	n. 8 w.	7
Norfolk, Va	28	16	23	9	n. 49 e.	18
Richmond, Va	29	15	19	13	n. 23 e.	15
Wytheville, Va	15	6	19	30	n. 51 w.	14
South Atlantic States.						
Asheville, N. C	20	23	19	18	s. 18 e.	3
Charlotte, N. C	20	19	25	14	n. 85 e.	11
Hatteras, N. C	24	16	24	14	n. 51 e.	13
Kittyhawk, N. C.*						
Raleigh, N. C	26	15	19	17	n. 10 e.	11
Wilmington, N. C	24	22	14	17	n. 56 w.	4
Charleston, S. C	16	20	26	16	s. 68 e.	11
Columbia, S. C	16	16	25	16	e.	9
Augusta, Ga	22	15	21	23	n. 16 w.	7
Savannah, Ga	15	21	21	18	s. 27 e.	7
Jacksonville, Fla	17	23	24	17	s. 49 e.	9
Florida Peninsula.						
Jupiter, Fla	17	23	24	13	s. 61 e.	12
Key West, Fla	20	8	41	4	n. 72 e.	39
Sand Key, Fla.†	12	6	20	3	n. 71 e.	18
Tampa, Fla	19	12	17	24	n. 45 w.	10
Eastern Gulf States.						
Atlanta, Ga	20	21	20	17	s. 72 e.	3
Macon, Ga.†	11	8	7	11	n. 53 w.	5
Pensacola, Fla.†	7	11	13	5	s. 63 e.	9
Birmingham, Ala.†	7	11	13	6	s. 60 e.	8
Mobile, Ala	16	34	13	9	s. 13 e.	18
Montgomery, Ala	13	29	20	17	s. 11 e.	16
Meridian, Miss.†	10	13	9	7	s. 34 e.	4
Vicksburg, Miss	13	35	22	7	s. 34 e.	27
New Orleans, La	13	34	18	9	s. 23 e.	23
Western Gulf States.						
Shreveport, La	13	34	27	6	s. 45 e.	30
Fort Smith, Ark	15	11	32	11	n. 79 e.	21
Little Rock, Ark	19	21	23	13	s. 79 e.	10
Corpus Christi, Tex	9	37	32	4	s. 45 e.	40
Fort Worth, Tex	18	32	12	11	s. 4 e.	14
Galveston, Tex	10	42	18	3	s. 25 e.	35
Palestine, Tex	17	35	12	8	s. 13 e.	18
San Antonio, Tex	17	28	34	6	s. 68 e.	30
Taylor, Tex.†	12	16	6	1	s. 51 e.	6
Ohio Valley and Tennessee.						
Chattanooga, Tenn	19	21	18	14	s. 63 e.	4
Knoxville, Tenn	27	16	10	23	n. 50 w.	17
Memphis, Tenn	21	24	20	9	s. 75 e.	11
Nashville, Tenn	20	20	23	13	e.	10
Lexington, Ky.†	9	12	8	9	s. 18 w.	3
Louisville, Ky	18	19	18	18	s.	1
Evansville, Ind.†	11	9	14	6	n. 76 e.	8
Indianapolis, Ind	18	24	16	21	s. 40 w.	8
Cincinnati, Ohio	15	20	22	19	s. 31 e.	6
Columbus, Ohio	12	23	23	20	s. 15 e.	11
Pittsburg, Pa	22	24	15	18	s. 56 w.	4
Parkersburg, W. Va	16	24	13	23	s. 51 w.	13
Elkins, W. Va	15	18	5	31	s. 83 w.	26
Lower Lake Region.						
Buffalo, N. Y	10	19	13	29	s. 61 w.	18
Oswego, N. Y	10	27	16	20	s. 13 w.	18
Rochester, N. Y	7	23	11	31	s. 51 w.	26
Syracuse, N. Y	10	25	14	23	s. 31 w.	18
Erie, Pa	16	22	9	25	s. 69 w.	17
Cleveland, Ohio	14	25	21	20	s. 5 e.	11
Sandusky, Ohio†	7	10	6	14	s. 69 w.	8
Toledo, Ohio	11	19	21	23	s. 14 w.	8
Detroit, Mich	17	19	20	20	s.	2
Upper Lake Region.						
Alpena, Mich	16	18	22	21	s. 27 e.	2
Escanaba, Mich	29	16	16	14	n. 9 e.	13
Grand Rapids, Mich	16	16	25	18	e.	7
Houghton, Mich.†	7	6	14	11	n. 72 e.	3
Marquette, Mich	23	16	17	23	n. 41 w.	9
Port Huron, Mich	15	26	15	20	s. 24 w.	12
Sault Ste. Marie, Mich	17	10	27	24	n. 23 e.	8
Chicago, Ill	19	19	17	18	w.	1
Milwaukee, Wis	22	14	19	22	n. 21 w.	8
Green Bay, Wis	24	17	19	17	n. 16 e.	7
Duluth, Minn	31	4	26	19	n. 15 e.	28
North Dakota.						
Moorhead, Minn	23	14	23	19	n. 24 e.	10
Bismarck, N. Dak	25	11	24	18	n. 23 e.	15
Williston, N. Dk.	16	14	25	18	n. 74 e.	7
Upper Mississippi Valley.						
Minneapolis, Minn.*	13	7	12	9	n. 27 e.	7
St. Paul, Minn	20	12	26	21	n. 32 e.	9
La Crosse, Wis†	12	10	9	8	n. 27 e.	2
Davenport, Iowa	22	13	23	22	n. 6 e.	9
Des Moines, Iowa	19	17	19	20	n. 27 w.	2
Dubuque, Iowa	22	17	19	24	n. 45 w.	7
Keokuk, Iowa	22	16	22	20	n. 18 e.	6
Cairo, Ill	21	25	19	11	s. 63 e.	9
Springfield, Ill	18	24	19	20	s. 9 w.	6
Hannibal, Mo.†	8	9	11	13	s. 63 w.	2
St. Louis, Mo	16	20	25	16	s. 66 e.	10
Missouri Valley.						
Columbia, Mo.*	9	7	12	11	n. 27 e.	2
Kansas City, Mo	25	15	25	17	n. 39 e.	13
Springfield, Mo	17	26	22	13	s. 45 e.	13
Topeka, Kans.*	14	7	12	4	n. 49 e.	11
Lincoln, Nebr	25	20	20	11	n. 61 e.	10
Omaha, Nebr	28	16	15	15	n.	12
Valentine, Nebr	24	15	19	18	n. 6 e.	9
Sioux City, Iowa†	12	8	11	6	n. 51 e.	6
Pierre, S. Dak	24	8	27	16	n. 34 e.	19
Huron, S. Dak	25	12	23	17	n. 25 e.	14
Yankton, S. Dak.†	9	2	15	11	n. 30 e.	8
Northern Slope.						
Havre, Mont	22	11	20	27	n. 32 w.	13
Miles City, Mont	36	12	10	17	n. 16 w.	25
Helena, Mont	13	21	6	37	s. 76 w.	32
Kalispell, Mont	8	19	12	31	s. 60 w.	22
Rapid City, S. Dak	20	11	19	24	n. 29 w.	10
Cheyenne, Wyo	21	17	6	34	n. 82 w.	28
Lander, Wyo	20	19	15	22	n. 82 w.	7
Yellowstone Park, Wyo	9	38	4	28	s. 40 w.	38
North Platte, Nebr	17	16	19	22	n. 72 w.	3
Middle Slope.						
Denver, Colo	23	26	10	15	s. 59 w.	6
Pueblo, Colo	23	12	18	26	n. 36 w.	14
Concordia, Kans	19	23	19	9	s. 68 e.	11
Dodge, Kans	23	19	19	15	n. 45 e.	6
Wichita, Kans	23	20	22	6	n. 79 e.	16
Oklahoma, Okla	17	31	16	12	s. 16 e.	15
Southern Slope.						
Abilene, Tex	16	35	11	9	s. 6 e.	19
Amarillo, Tex	13	34	8	22	s. 34 w.	25
Southern Plateau.						
El Paso, Tex	19	4	8	45	n. 68 w.	40
Santa Fe, N. Mex	19	24	11	27	s. 73 w.	17
Flagstaff, Ariz	13	23	3	39	s. 74 w.	37
Phoenix, Ariz	10	10	24	27	w.	3
Yuma, Ariz	12	12	9	37	w.	28
Independence, Cal	22	18	8	28	n. 79 w.	20
Middle Plateau.						
Carson City, Nev	8	30	11	27	s. 36 w.	27
Winnemucca, Nev	14	21	11	29	s. 68 w.	18
Modena, Utah	14	21	9	34	s. 74 w.	26
Salt Lake City, Utah	17	27	20	15	s. 27 e.	11
Grand Junction, Colo	23	13	14	25	n. 48 w.	15
Northern Plateau.						
Baker City, Oreg	12	34	25	13	s. 29 e.	25
Boise, Idaho	10	30	25	13	s. 31 e.	23
Lewiston, Idaho†	5	4	18	9	n. 84 e.	9
Pocatello, Idaho	1	28	28	20	s. 17 e.	28
Spokane, Wash	8	33	23	11	s. 26 e.	28
Walla Walla, Wash	7	42	12	12	s.	35
North Pacific Coast Region.						
North Head, Wash	8	25	27	13	s. 39 e.	22
Port Crescent, Wash.*	9	8	13	12	n. 45 e.	1
Seattle, Wash	15	25	26	10	s. 58 e.	19
Tacoma, Wash	17	29	3	24	s. 60 w.	24
Tatoosh Island, Wash	3	20	30	16	s. 39 e.	22
Portland, Oreg	8	31	19	18	s. 2 e.	23
Roseburg, Oreg	9	34	10	26	s. 33 w.	30
Middle Pacific Coast Region.						
Eureka, Cal	11	31	15	18	s. 9 w.	20
Mount Tamalpais, Cal	12	23	6	36	s. 70 w.	32
Red Bluff, Cal	12	31	25	10	s. 38 e.	24
Sacramento, Cal	8	36	19	16	s. 6 e.	28
San Francisco, Cal	6	21	12	36	s. 58 w.	28
Point Reyes Light, Cal*	6	14	3	14	s. 54 w	14
Southeast Farallon, Cal*	6	14	4	14	s. 51 w.	13
South Pacific Coast Region.						
Fresno, Cal	31	12	14	23	n. 25 w.	21
Los Angeles, Cal	16	11	20	28	n. 58 w.	9
San Diego, Cal	31	9	10	29	n. 41 w.	29
San Luis Obispo, Cal	27	11	2	26	n. 56 w.	29
West Indies						
Basseterre, St. Kitts, W. I.						
Bridgetown, Barbados						
Cienfuegos, Cuba						
Colon, Colombia, S. A.†						
Curaçoa, W. I.						
Grand Turk, W. I.†	3	3	26	0	e.	26
Hamilton, Bermuda	13	22	13	29	s. 61 w.	18
Havana, Cuba†	2	2	26	1	e.	25
Kingston, Jamaica						
Port of Spain, Trinidad†						
Puerto Principe, Cuba						
Roseau, Dominica, W. I.†						
San Juan, Porto Rico	2	21	44	4	s. 65 e.	44
Santiago de Cuba, Cuba						

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, March, 1904.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total No.	Total Days.	
Alabama	60	T.	1	4	7	1	....	3	....	....	....	3	1	3	11	7	2	....	3	2	....	5	3	7	3	1	1	6	3	....	....	1	....	78	22	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	1	1	A.
Arizona	56	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	5	1	....	....	....	....	1	....	....	8	4	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Arkansas	57	T.	3	1	1	1	1	2	....	....	....	7	1	16	6	....	....	7	14	1	6	16	7	13	2	11	12	3	....	....	1	1	9	142	24	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
California	167	T.	....	....	....	....	....	2	4	1	..	1	2	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	12	7	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	2	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Colorado	70	T.	....	1	....	1	....	....	....	....	3	....	....	....	....	....	1	4	....	....	1	2	....	....	....	....	....	....	....	....	7	7	3	30	10	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Connecticut	21	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Delaware	5	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Dist. of Columbia	4	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	1	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Florida	61	T.	....	1	5	5	1	3	5	....	....	....	1	....	1	10	2	....	2	....	3	4	2	....	....	....	2	5	7	4	....	....	....	63	18	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Georgia	67	T.	6	8	13	2	....	2	1	....	....	....	2	....	8	10	....	....	....	1	....	....	9	3	11	2	....	6	....	....	....	....	....	84	15	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Idaho	34	T.	....	....	....	....	....	....	1	5	....	....	....	....	....	1	....	....	....	....	3	3	....	....	....	....	....	....	....	....	....	....	....	13	5	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Illinois	84	T.	....	13	13	....	....	2	....	....	....	14	....	....	10	1	....	....	....	1	3	7	38	30	....	36	30	3	....	....	4	32	44	281	17	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Indiana	58	T.	4	17	17	....	....	1	1	....	....	10	....	....	3	1	....	..	1	....	11	....	10	30	....	10	33	10	....	....	....	18	29	206	17	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Indian Territory	20	T.	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	2	3	1	1	1	....	....	....	2	1	....	....	....	....	1	1	14	10	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	28	1	2	52	1	....	....	....	2	7	11	109	11	A.
Iowa	128	T.	....	2	2	....	....	....	....	....	....	....	....	....	1	....	....	5	11	1	1	11	1	....	3	24	2	....	....	1	1	10	5	100	18	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	10	4	12	14	2	1	7	10	....	....	....	4	1	93	19	A.
Kansas	88	T.	1	1	....	....	....	....	....	....	11	10	....	....	1	....	....	....	1	1	1	1	1	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Kentucky	41	T.	....	1	10	....	....	1	1	....	1	10	....	....	2	....	....	....	1	1	10	4	12	14	2	1	7	10	....	....	....	4	1	93	19	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Louisiana	46	T.	5	1	3	1	3	9	....	....	....	3	1	....	9	3	....	1	12	10	7	8	3	7	10	....	1	10	1	....	....	1	2	111	23	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	0	0	A.
Maine	25	T.	....	....	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	10	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Maryland	42	T.	....	....	2	..	....	....	3	....	....	....	....	....	..	....	....	....	....	....	....	....	....	5	3	....	1	1	....	....	....	....	1	16	7	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	0	0	A.
Massachusetts	48	T.	....	....	3	....	....	2	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7	4	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Michigan	106	T.	....	32	12	....	....	....	....	....	....	....	....	....	....	1	....	....	1	....	1	....	3	22	....	6	12	....	....	....	....	....	5	95	10	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	9	1	....	4	1	....	....	....	....	1	....	18	6	A.
Minnesota	67	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Mississippi	57	T.	9	2	....	....	....	5	1	....	....	4	2	4	11	2	....	1	12	2	1	10	5	9	3	1	1	10	1	....	....	1	1	98	23	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Missouri	86	T.	....	1	....	....	....	1	1	....	1	18	1	5	28	1	....	7	11	....	10	13	35	19	1	55	24	1	....	....	2	36	41	312	22	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Montana	54	T.	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Nebraska	137	T.	....	....	....	1	....	1	1	1	11	3	....	7	....	....	....	1	....	....	....	2	....	....	....	15	....	....	....	1	4	14	5	67	14	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	1	....	4	1	....	....	13	7	A.
Nevada	40	T.	....	....	....	3	....	....	1	2	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
New Hampshire	21	T.	....	....	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	....	....	0	0	A.
New Jersey	48	T.	....	1	2	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	1	....	....	....	....	....	6	5	A.
New Mexico	31	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	2	2	A.
New York	129	T.	6	6	34	....	....	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....	3	24	23	....	10	....	....	....	....	....	7	115	10	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	1	A.
North Carolina	56	T.	3	3	4	2	....	7	3	1	6	9	....	5	21	1	....	1	8	1	3	3	6	10	5	1	3	4	....	....	....	....	....	110	23	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	....	....	....	....	....	....	....	0	0	A.
North Dakota	48	T.	....	1	4	2	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	2	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Ohio	101	T.	3	24	39	2	1	2	....	....	....	1	....	....	1	1	....	....	....	2	....	....	3	55	2	5	36	29	2	....	1	16	42	267	20	T.
		A.	....	....	....	....	....	....	....	....	3	....	....	....	....	....	1	1	....	1	2	....	....	....	....	5	....	....	....	....	....	....	....	13	6	A.
Oklahoma	36	T.	....	....	....	....	....	....	....	....	1	1	1	....	....	....	....	....	....	1	4	1	....	....	....	....	....	....	....	....	....	....	....	10	7	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	26	9	1	5	2	....	....	....	....	....	9	83	9	A.
Oregon	70	T.	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Pennsylvania	91	T.	5	1	25	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Rhode Island	6	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
South Carolina	54	T.	8	10	16	4	....	3	4	....	....	1	4	....	7	18	....	....	....	1	....	....	9	2	16	12	....	11	1	....	....	....	1	128	18	T.
		A.	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	2	....	....	3	....	....	....	....	....	....	....	....	0	0	A.
South Dakota	56	T.	12	5	2	....	....	1	....	....	....	22	4	2	19	9	....	....	4	3	9	6	22	29	10	....	3	8	1	....	....	1	3	175	21	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Tennessee	56	T.	1	....	....	1	2	1	....	....	....	....	5	11	....	....	7	11	13	9	5	8	3	2	7	7	8	1	....	....	....	1	103	19	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Texas	126	T.	....	....	....	....	....	....	6	7	....	....	....	....	....	....	....	....	....	....	....	9	....	1	10	....	....	....	....	....	....	....	....	59	9	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7	1	....	....	....	....	....	....	....	....	13	3	A.
Utah	64	T.	....	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Vermont	12	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Virginia	40	T.	7	....	1	....	....	....	4	1	....	....	8	....	....	....	....	....	....	5	....	....	....	9	6	....	1	....	....	....	....	....	....	42	9	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Washington	71	T.	....	1	....	....	....	....	....	....	....	1	1	2	....	....	....	5	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	11	6	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
West Virginia	47	T.	6	....	16	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	25	8	3	1	2	....	....	....	....	4	....	67	10	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	2	A.
Wisconsin	63	T.	1	27	1	....	1	....	....	....	....	1	....	....	....	....	....	....	....	....	1	12	8	1	21	2	....	....	....	....	....	1	....	76	11	T.
		A.	....	....	2	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	....	....	1	....	....	....	....	....	....	....	....	....	3	2	A.
Wyoming	38	T.	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	1	....	....	12	5	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Sums	2993	T.	82	163	245	24	8	40	40	23	35	120	39	46	134	86	6	38	93	54	85	120	227	361	144	283	197	131	21	20	37	159	228	3,289	....	T.
		A.	1	1	6	3	2	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	19	....	A.

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during March, 1904, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	‡			0.66														*			
Alpena, Mich.	31			0.35														0.09			
Amarillo, Tex.	3			T.																	
Asheville, N. C.	6–7			2.02														0.41			
Atlanta, Ga.	13			0.76														0.43			
Atlantic City, N. J.	11			0.37														0.17			
Augusta, Ga.	23–24	7:37 p. m.	8:45 a. m.	2.19	4:27 a. m.	5:25 a. m.	0.87	0.15	0.34	0.56	0.61	0.66	0.67	0.68	0.70	0.72	0.78	0.97			
Baltimore, Md.	7			0.93														0.22			
Binghamton, N. Y.	31			0.58														0.34			
Birmingham, Ala.	6			1.05														0.59			
Bismarck, N. Dak.	24–25			0.42														*			
Block Island, R. I.	7–8			0.35														*			
Boise, Idaho.	28–29			2.46														0.34			
Boston, Mass.	7–8			0.76														0.22			
Buffalo, N. Y.	25–26			0.98														0.30			
Cairo, Ill.	31	8:40 p. m.	11:50 p. m.	1.01	9:34 p. m.	10:08 p. m.	0.06	0.05	0.12	0.16	0.40	0.71	0.83	0.93							
Charleston, S. C.	23–24			0.67														0.48			
Charlotte, N. C.	22			0.45														0.28			
Chattanooga, Tenn.	22–23			1.45														0.47			
Chicago, Ill.	24–25			0.85														*			
Cincinnati, Ohio.	25–26	9:10 p. m.	D. N.	2.07	10:58 p. m.	12:00 mid't	0.53	0.06	0.12	0.19	0.35	0.53	0.73	0.77	0.81	0.88	0.94	1.05			
Cleveland, Ohio.	25–26			1.40														0.35			
Columbia, Mo.	24	4:32 p. m.	7:15 p. m.	1.27	4:59 p. m.	5:20 p. m.	T.	0.49	0.69	0.79	0.90	0.94	0.97								
Columbia, S. C.	26–27			0.97														0.55			
Columbus, Ohio.	25–26			1.63														0.62			
Concord, N. H.	7–8			1.19														*			
Corpus Christi, Tex.	26–27			0.11														0.05			
Davenport, Iowa.	30–31			0.69														*			
Denver, Colo.	30–31			0.30														*			
Des Moines, Iowa.	24			0.32														*			
Detroit, Mich.	2			0.27														0.20			
Dodge, Kans.	5			0.04																	
Dubuque, Iowa.	21	1:00 a. m.	6:45 p. m.	0.94	9:12 a. m.	9:40 a. m.	0.15	0.12	0.31	0.45	0.54	0.58	0.63					*			
Duluth, Minn.	2			0.67														*			
Eastport, Me.	7–8			1.60														0.23			
Elkins, W. Va.	3			0.78														0.44			
Erie, Pa.	30–31			0.76														0.21			
Escanaba, Mich.	24			0.91														0.43			
Evansville, Ind.	25	2:05 a. m.	7:50 a. m.	1.92	6:07 a. m.	6:31 a. m.	1.32	0.06	0.19	0.37	0.47	0.55									
Fort Smith, Ark.	24	3:32 p. m.	6:35 p. m.	0.96	4:24 p. m.	4:59 p. m.	T.	0.09	0.15	0.26	0.37	0.54	0.66	0.77	0.78	0.81					
Fort Worth, Tex.	25	12:45 a. m.	3:15 a. m.	1.08	12:47 a. m.	1:00 a. m.	T.	0.31	0.69	0.81	0.83										
		5:45 a. m.	9:15 a. m.	2.32	8:03 a. m.	8:52 a. m.	0.03	0.12	0.50	0.78	0.98	1.19	1.75	1.99	2.14	2.21	2.24	2.27			
Galveston, Tex.	19			0.22														0.19			
Grand Junction, Colo.	28–29			0.25														0.08			
Grand Rapids, Mich.	21–22			0.46														0.30			
Green Bay, Wis.	24			0.90														*			
Harrisburg, Pa.	7			0.77														0.33			
Hatteras, N. C.	14			0.80														0.53			
Huron, S. Dak.	30–31			0.10														0.02			
Indianapolis, Ind.	25–26	7:54 a. m.	12:45 a. m.	4.74	12:07 p. m.	1:42 p. m.	1.39	0.15	0.26	0.32	0.44	0.57	0.70	0.76	0.83	0.90	0.94	1.04	1.35	1.54	
	31	8:40 p. m.	11:45 p. m.	2.52	*8:50 p. m.	9:56 p. m.	0.03	0.09	0.33	0.66	0.91	1.08	1.16	1.26	1.38	1.52	1.64	1.76	1.89		
Jacksonville, Fla.	27			0.48								0.41									
Jupiter, Fla.	29	2:10 a. m.	8:12 a. m.	1.87	2:27 a. m.	3:20 a. m.	0.03	0.08	0.15	0.45	0.57	0.76	0.88	0.98	1.00	1.13	1.36	1.45			
Kalispell, Mont.	28			0.34														*			
Kansas City, Mo.	24	12:05 p. m.	3:15 p. m.	1.79	2:01 p. m.	2:41 p. m.	0.16	0.31	0.43	0.56	0.90	1.15	1.30	1.39	1.58	1.60					
	30	12:45 a. m.	7:50 a. m.	1.37	1:12 a. m.	2:00 a. m.	0.07	0.06	0.20	0.36	0.41	0.49	0.59	0.79	0.84	0.93	0.96				
Key West, Fla.	15	6:10 a. m.	10:30 a. m.	1.44	7:22 a. m.	7:50 a. m.	0.03	0.06	0.17	0.54	0.72	0.80	0.84								
Knoxville, Tenn.	21			1.18														0.27			
La Crosse, Wis.	24			0.60														0.31			
Lewiston, Idaho.	10			0.22														0.22			
Lexington, Ky.	26			1.27														*			
Lincoln, Nebr.	11–12			0.38														*			
Little Rock, Ark.	16–17			1.62														0.57			
Los Angeles, Cal.	10–11			1.70														0.54			
Louisville, Ky.	25–26	10:05 p. m.	D. N.	1.15	11:05 p. m.	11:25 p. m.	0.01	0.05	0.34	0.50	0.55										
Lynchburg, Va.	6–7			1.11														0.33			
Macon, Ga.	6–7			0.75														0.14			
Memphis, Tenn.	25–26	11:02 p. m.	D. N.	1.96	11:04 p. m.	12:01 a. m.	T.	0.18	0.25	0.34	0.56	0.63	0.70	0.76	0.88	0.95	0.99	1.13			
Meridian, Miss.	20			0.93														0.52			
Milwaukee, Wis.	30–31			0.57														0.18			
Montgomery, Ala.	26			0.26														0.26			
Nantucket, Mass.	23			0.31														0.23			
Nashville, Tenn.	26			1.65														0.53			
New Haven, Conn.	7–8			1.27														*			
New Orleans, La.	17	4:40 p. m.	11:10 p. m.	2.91	5:50 p. m.	6:50 p. m.	0.01	0.06	0.35	0.57	0.80	1.21	1.61	1.70	1.83	1.99	2.07	2.20			
New York, N. Y.	7			1.26														0.23			
Norfolk, Va.	7			1.27														0.72			
Northfield, Vt.	7–8			0.82														*			
North Head, Wash.	4–5			0.76														0.25			
Oklahoma, Okla.	16			0.20								0.20									
Omaha, Nebr.	30			0.39														0.17			
Palestine, Tex.	16			0.27														0.23			
Parkersburg, W. Va.	22	4:35 p. m.	10:00 p. m.	1.17	4:38 p. m.	4:47 p. m.	T.	0.28	0.51	0.55											
Pensacola, Fla.	19			0.52														0.18			
Philadelphia, Pa.	7			1.07														0.22			
Pittsburg, Pa.	3			1.66														*			
Pocatello, Idaho.	17–18			0.88														*			
Portland, Me.	7–8			0.84														0.19			
Portland, Oreg.	3			0.98														0.15			
Pueblo, Colo.	31			0.34														0.17			
Raleigh, N. C.	6–7			1.59														0.58			
Richmond, Va.	7			1.28														0.46			
Rochester, N. Y.	7			0.97														*			
Sacramento, Cal.	27–28			1.29														0.22			
St. Louis, Mo.	24	8:39 p. m.	11:00 p. m.	0.62	8:39 p. m.	8:50 p. m.	0.00	0.11	0.38	0.42	0.44	0.46									
	31	7:18 p. m.	8:19 p. m.	0.89	7:28 p. m.	8:10 p. m.	0.01	0.12	0.26	0.27	0.33	0.57	0.71	0.75	0.87			0.16			
St. Paul, Minn.	20–21			0.46														*			
Salt Lake City, Utah.	8–9			0.93							0.15										
San Antonio, Tex.	18			0.15														0.30			
San Diego, Cal.	11			0.67														0.56			
Sandusky, Ohio.	31			0.63																	

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
San Francisco, Cal	9-10			1.32														0.31			
Savannah, Ga	24			0.53														0.45			
Scranton, Pa	7-8			0.50														0.16			
Seattle, Wash	10			0.24														0.15			
Shreveport, La	20			0.58														0.48			
Spokane, Wash	13-14			0.59														*			
Springfield, Ill	24	7:55 p. m.	9:55 p. m.	0.82	8:45 p. m.	8:56 p. m.	0.06	0.33	0.53	0.60	0.61										
Springfield, Mo	30	7:51 p. m.	10:43 p. m.	1.03	8:10 p. m.	8:40 p. m.	0.02	0.06	0.13	0.27	0.39	0.63	0.77	0.79							
Syracuse, N. Y	6-7			0.40														*			
Tampa, Fla	7			0.30									0.30								
Taylor, Tex	18			0.44														0.39			
Toledo, Ohio	30-31			0.79														0.29			
Topeka, Kans	24			1.03														*			
Valentine, Nebr	9-10			0.60														*			
Vicksburg, Miss	6	1:10 a. m.	5:05 a. m.	1.51	1:30 a. m.	1:55 a. m.	0.05	0.08	0.22	0.38	0.46	0.50	0.53	0.56	0.60						
Washington, D. C	7			0.97														0.19			
Wichita, Kans	24	12:10 a. m.	11:57 a. m.	1.95	5:37 a. m.	6:10 a. m.	0.58	0.08	0.15	0.30	0.47	0.59	0.67	0.70							
Wilmington, N. C	14	5:05 a. m.	8:35 a. m.	0.77	6:42 a. m.	7:01 a. m.	0.09	0.07	0.22	0.46	0.63										
Wytheville, Va	6 7			1.01														*			
Yankton, S. Dak	21			0.43														*			
Havana, Cuba	16			0.63														0.57			
San Juan, Porto Rico	10	4:00 p. m.	5:30 p. m.	0.51	4:30 p. m.	4:49 p. m.	0.04	0.18	0.25	0.40	0.45										

* Self register not working. † No precipitation during the month. ‡ February 29 to March 1.

TABLE VI.—*Data furnished by the Canadian Meteorological Service, March, 1904.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Pressure, in inches. Sea level, reduced to mean of 24 hours.	Pressure, in inches. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F	29.74	29.88	.00	24.3	— 3.4	32.4	16.1	5.34	+0.58	13.0
Sydney, C. B. I	29.96	30.00	+.12	24.7	— 1.5	32.9	16.4	3.25	—1.68	19.5
Halifax, N. S	29.94	30.05	+.11	29.0	0.0	36.4	21.6	5.59	+0.13	9.6
Grand Manan, N. B	29.94	30.00	+.07	29.9	+ 0.1	37.3	22.5	5.33	+1.05	22.7
Yarmouth, N. S	29.88	30.05	+.10	29.9	— 0.9	36.0	23.7	2.73	—2.12	7.6
Charlottetown, P. E. I	29.95	29.99	+.09	23.9	— 1.5	31.9	15.8	3.98	+0.77	21.2
Chatham, N. B	29.99	30.02	+.12	23.7	+ 0.7	35.4	11.9	3.39	—0.08	19.9
Father Point, Que	29.95	29.98	+.08	21.0	+ 0.7	29.4	12.5	3.97	+1.24	34.1
Quebec, Que	29.69	30.03	+.07	21.7	+ 0.5	29.8	13.6	4.03	+0.77	23.3
Montreal, Que	29.84	30.06	+.06	24.1	+ 0.3	31.1	17.1	4.01	+0.22	15.9
Bissett, Ont										
Ottawa, Ont	29.70	30.04	+.03	24.0	+ 2.5	31.9	16.1	4.66	+1.94	17.8
Kingston, Ont	29.74	30.07	+.06	26.5	+ 0.9	33.8	19.1	3.30	+0.66	6.0
Toronto, Ont	29.67	30.07	+.05	28.7	+ 1.4	35.4	22.0	2.98	+0.34	6.5
White River, Ont	28.71	30.08	+.05	13.6	+ 1.4	27.7	— 0.5	1.15	—0.23	11.0
Port Stanley, Ont	29.38	30.04	+.01	30.1	+ 2.9	37.2	22.9	4.05	+1.17	13.4
Saugeen, Ont	29.31	30.04	+.01	26.2	+ 1.5	34.7	17.6	3.56	+0.91	12.3
Parry Sound, Ont	29.27	29.99	—.03	24.0	+ 2.9	33.7	14.2	3.15	+0.92	16.0
Port Arthur, Ont	29.33	30.06	+.01	18.4	+ 1.6	28.6	8.2	1.14	+0.17	7.8
Winnipeg, Man										
Minnedosa, Man	28.14	30.05	—.01	12.3	— 0.2	21.9	2.6	1.77	+1.12	17.7
Qu'Appelle, Assin	27.64	30.00	—.04	8.3	— 6.6	17.4	— 0.8	4.11	+3.34	41.1
Medicine Hat, Assin	27.59	29.97	—.03	16.2	—11.3	25.3	7.1	1.20	+0.44	12.0
Swift Current, Assin	27.32	30.03	+.01	11.6	—10.4	19.8	3.4	1.94	+1.13	19.4
Calgary, Alberta	26.25	29.95	.00	13.3	—12.9	23.1	3.5	0.86	+0.14	8.6
Banff, Alberta	25.15	29.93	—.01	15.7	— 4.5	28.5	3.0	1.35	—0.06	13.5
Edmonton, Alberta	27.58	29.99	+.03	11.5	—12.7	23.7	— 0.6	1.81	+1.09	18.1
Prince Albert, Sask	28.39	30.03	—.05	8.0	— 4.0	18.9	— 2.9	2.56	+1.79	24.5
Battleford, Sask	28.24	30.08	+.02	7.5	— 5.6	16.3	— 1.2	1.81	+1.35	18.1
Kamloops, B. C										
Victoria, B. C	29.70	29.80	—.17	41.0	— 0.9	45.2	36.8	3.62	+0.50	1.9
Barkerville, B. C	25.38	29.77	—.11	29.2	— 5.9	30.7	9.7	2.70	+0.81	27.0
Hamilton, Bermuda	29.96	30.13	+.05	64.0	+ 1.8	69.8	58.2	3.40	—1.73	....
Dawson, Yukon	28.93			— 2.5		10.0	—15.0	0.20		2.0

TABLE VII.—*Heights of rivers referred to zeros of gages, March, 1904.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn.[1]	1,954	14						
Red Wing, Minn.[2]	1,914	14						
Reeds Landing, Minn	1,884	12	3.6	30, 31	0.7	7-18	1.5	2.9
La Crosse, Wis.[2]	1,819	12						
Prairie du Chien, Wis.[2]	1,759	18						
Dubuque, Iowa[3]	1,699	18	10.2	26	8.0	30		2.2
Leclaire, Iowa[4]	1,609	10	7.1	27	5.3	23, 31		1.8
Davenport, Iowa[4]	1,593	15	10.9	27	9.2	31		1.7
Muscatine, Iowa	1,562	16	13.2	28	5.1	1	8.6	8.1
Galland, Iowa[5]	1,472	8	7.2	30	2.5	12	4.2	4.7
Keokuk, Iowa[5]	1,463	15	12.4	29, 30	5.3	15, 16	8.1	7.1
Hannibal, Mo	1,402	13	14.1	31	4.8	1-3	7.9	9.3
Grafton, Ill	1,306	23	18.6	31	6.6	1, 2	11.2	12.0
St. Louis, Mo	1,264	30	25.2	30	7.2	2, 3	13.4	18.0
Chester, Ill	1,189	30	22.9	30, 31	6.5	3	11.6	16.4
New Madrid, Mo	1,003	34	35.7	31	17.8	3	25.7	17.9
Memphis, Tenn	843	33	31.2	31	13.9	1	21.9	17.3
Helena, Ark	767	42	38.4	31	19.4	1	28.6	19.0
Arkansas City, Ark	635	42	39.1	31	22.8	1, 2	30.0	16.3
Greenville, Miss	595	42	33.0	31	18.4	1, 2	24.8	14.6
Vicksburg, Miss	474	45	36.2	31	20.3	4, 5	26.8	15.9
Natchez, Miss	373	46	34.6	31	21.4	5	26.5	13.2
Baton Rouge, La	240	35	24.9	31	14.5	5-8	18.0	10.4
Donaldsonville, La	188	28	19.4	31	10.1	7, 8	13.3	9.3
New Orleans, La	108	16	12.3	31	6.5	7, 8	8.5	5.8
Yellowstone River.								
Glendive, Mont[6]	98	17	8.4	31	5.5	29	7.2	2.9
James River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Lamoure, N. Dak[2]		25						
Huron, S. Dak.[2]	210	25						
Missouri River.								
Townsend, Mont[7]	2,504	10	4.4	15	3.5	25	4.0	0.9
Fort Benton, Mont[6]	2,285	12	5.9	25	1.5	22, 23, 30	3.7	4.4
Bismarck, N. Dak	1,309	14	6.3	24, 25	0.5	2	3.2	5.8
Pierre, S. Dak.[8]	1,114	19	5.3	22	1.8	27		3.5
Sioux City, Iowa[9]	784	18	12.4	20	5.8	29-31		6.6
Omaha, Nebr.[10]	669	10	9.6	22	6.4	30		3.2
Plattsmouth, Nebr	481	17	5.7	5,7	2.9	15-17	4.0	2.8
St. Joseph, Mo	641	21	5.4	23, 24	0.9	4	2.7	4.5
Kansas City, Mo	388		12.7	26	6.5	1, 5, 6	8.8	6.2
Glasgow, Mo	231		9.3	27	2.1	7, 8	4.7	7.2
Boonville, Mo	199	20	13.3	29	5.9	3	8.5	7.4
Hermann, Mo	103	24	15.5	29	5.5	10	8.2	10.0
Des Moines River.								
Des Moines, Iowa[11]	205	19	4.2	26, 27	2.5	5-21	3.0	1.7
Illinois River.								
Peoria, Ill	135	14	23.0	28, 29	14.0	1	18.7	9.0
Allegheny River.								
Warren, Pa	177	14	11.4	27	2.2	1, 20	6.3	9.2
Oil City, Pa	123	13	14.4	27	2.7	18	7.3	11.7
Parker, Pa	73	20	16.6	3	3.5	18, 19	8.3	13.1
Freeport, Pa	29	20	28.8	3	6.0	18	13.6	22.8
Red Bank Creek.								
Brookville, Pa	35	8	13.4	3	1.4	21, 22	2.7	12.0

TABLE VII.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Clarion River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Clarion, Pa.	32	10	13.9	3	2.0	18	5.4	11.9
Conemaugh River.								
Johnstown, Pa.	64	7	10.0	3	2.6	19	4.2	7.4
Cheat River.								
Rowlesburg, W. Va.	36	14	6.0	4	2.8	14	3.9	3.2
Youghiogheny River.								
Confluence, Pa.	59	23	6.6	23	1.5	18	3.1	5.1
West Newton, Pa.	15	10	18.6	1	2.0	17, 18	5.1	16.6
Monongahela River.								
Weston, W. Va.	161	18	6.6	7	— 0.3	19, 20	0.5	6.9
Fairmont, W. Va.	119	25	20.6	7	15.5	31	17.1	5.1
Greensboro, Pa.	81	18	15.2	4	8.4	31	10.5	6.8
Lock No. 4, Pa.	40	28	20.2	24	8.7	31	12.5	11.5
Ohio River.								
Pittsburg, Pa.	966	22	26.9	4	5.2	18, 19	12.5	21.7
Davis Island Dam, Pa.	960	25	24.9	4	7.1	19	13.0	17.8
Beaver Dam, Pa.	935	27	37.0	4	9.4	18	19.2	27.6
Wheeling, W. Va.	875	36	38.5	5	9.3	19	20.2	29.2
Parkersburg, W. Va.	785	36	39.3	5	9.6	20	22.9	29.7
Point Pleasant, W. Va.	703	39	40.8	7	12.2	20	26.1	28.6
Huntington, W. Va.	660	50	43.1	8	16.4	20, 21	29.9	26.7
Catlettsburg, Ky.	651	50	44.3	8	15.9	21	30.4	28.4
Portsmouth, Ohio	612	50	45.3	8	17.4	21	31.8	27.9
Cincinnati, Ohio.	499	50	45.9	9	19.7	22	34.6	26.2
Madison, Ind.	413	46	40.2	28	18.0	22	29.8	22.2
Louisville, Ky.	367	28	22.9	28	8.2	22	13.8	14.7
Evansville, Ind.	184	35	39.3	31	17.4	1	28.8	21.9
Paducah, Ky.	47	40	41.3	31	16.3	1	27.5	25.0
Cairo, Ill.	1	45	46.8	31	22.3	1-3	32.5	24.5
Beaver River.								
Ellwood Junction, Pa.	10	14	22.8	1	3.2	19	6.0	19.6
Muskingum River.								
Zanesville, Ohio.	70	20	25.9	5	10.2	18	15.9	15.7
Little Kanawha River.								
Glenville, W. Va.	103	20	9.0	23	0.6	20, 30	2.4	8.4
New River.								
Radford, Va.	155	14	5.0	8	1.0	22-24	1.8	4.0
Hinton, W. Va.	95	14	6.0	9	2.3	19-22	3.2	3.7
Great Kanawha, River.								
Charleston, W. Va.	58	30	11.4	9	5.2	20, 21	7.0	6.2
Scioto River.								
Columbus, Ohio.	110	17	17.7	26	3.0	17	7.3	14.7
Licking River.								
Falmouth, Ky.	30	25	19.5	26	3.0	22	7.0	16.5
Miami River.								
Dayton, Ohio	77	18	13.2	27	2.5	17	4.9	10.7
Kentucky River.								
Beattyville, Ky.	254	30	11.8	27	1.8	2	3.9	10.0
High Bridge, Ky.	117	17	17.5	27	10.6	3	13.1	6.9
Frankfort, Ky.	65	31	13.8	27	7.2	2, 3	9.2	6.6
Wabash River.								
Mount Carmel, Ill.	50	15	26.5	31	10.8	1	17.8	15.7
Clinch River.								
Speers Ferry, Va.	156	20	3.5	8	0.7	6	1.6	2.8
Clinton, Tenn.	52	25	16.0	25	6.6	6	9.5	9.4
Holston River.								
Bluff City, Tenn.	170	15	5.7	24	1.5	17, 18, 21	2.2	4.2
Rogersville, Tenn.	103	14	7.0	24	2.5	19-21	3.6	4.5
French Broad River.								
Asheville, N. C.	144	6	3.4	7, 8	— 0.4	6	0.5	3.8
Leadvale, Tenn.	70	15	6.0	24	0.0	19	1.9	6.0
Hiwassee River.								
Charleston, Tenn	18	22	12.7	24	1.2	1	4.0	11.5
Tennessee River.								
Knoxville, Tenn.	635	29	12.6	25	2.6	20	5.2	10.0
Kingston, Tenn.	556	25	13.1	25	3.8	6	6.6	9.3
Chattanooga, Tenn.	452	33	22.1	25	5.8	21	10.4	16.3
Bridgeport, Ala.	402	24	17.4	26	4.3	21	8.5	13.1
Florence, Ala.	255	16	17.2	27, 28	4.6	7	8.8	12.6
Riverton, Ala.	225	25	27.2	28	6.1	1	12.5	21.1
Johnsonville, Tenn.	95	21	28.1	30	7.0	2	13.5	21.1
Cumberland River.								
Burnside, Ky.	518	50	31.4	27	4.6	3	12.6	26.8
Celina, Tenn.	383	45	33.2	27	6.6	4, 5	15.7	26.6
Carthage, Tenn.	308	40	34.2	28	5.6	6	15.4	28.6
Nashville, Tenn.	193	40	37.6	27	8.7	6	19.4	28.9
Clarksville, Tenn.	126	42	44.0	28	11.9	6	23.6	32.1
Arkansas River.								
Wichita, Kans.	832	10	0.7	25	— 0.1	10	0.2	0.8
Webbers Falls, Ind. T.	465	23	5.8	31	2.7	24	3.2	3.1
Fort Smith, Ark.	403	22	12.0	27	1.8	13	3.8	10.2
Dardanelle, Ark.	256	21	14.5	27	1.9	12-15	4.7	12.6
Little Rock, Ark.	176	23	16.3	28	4.0	14	7.1	12.3
White River.								
Newport, Ark.	150	26	28.9	29	4.2	13	9.7	24.7
Yazoo River.								
Yazoo City, Miss.	80	25	15.0	31	0.0	1-5	5.9	15.0
Ouachita River.								
Camden, Ark.	304	39	32.6	30	9.0	13	20.4	23.6
Monroe, La.	122	40	20.6	31	14.5	1	16.8	6.1
Red River.								
Arthur City, Tex.	688	27	14.0	27	4.0	12-17	6.1	10.0
Fulton, Ark.	515	28	22.5	29	6.5	12, 13	12.5	16.0
Shreveport, La.	327	29	12.9	31	1.0	16, 17	5.3	11.9
Alexandria, La.	118	33	14.0	31	2.0	19-21	6.2	12.0
Atchafalaya River.								
Melville, La.	100	31	29.3	31	21.7	5, 6, 10, 11	24.2	7.6
Penobscot River.								
Mattawamkeag, Me.[2]	87	.....	.....	.....	.....	.....	.....	.....
Montague, Me.[2]	60	.....	.....	.....	.....	.....	.....	.....
Kennebec River.								
Winslow, Me.	46	.....	5.8	27, 28	2.4	5	4.2	3.4
Merrimac River.								
Franklin Junction, N. H.[9]	110	.....	8.8	28	4.1	20	6.1	4.7
Merrimac River—Cont'd.								
Concord, N. H.[12]	94	.....	.....		.....		.....	.....
Manchester, N. H.	68	.....	4.7	13	2.3	31	3.5	2.4
Connecticut River.								
Wells River, Vt.[12]	255	.....	.....		.....		.....	.....
White River Junction, Vt.[13]	209	.....	13.4	27	9.3	24	.....	4.1
Bellows Falls, Vt.	170	12	8.2	27	1.1	3	3.3	7.1
Holyoke, Mass.	84	9	9.5	27	0.4	4	2.8	9.1
Hartford, Conn.	50	13	19.5	28	5.0	3	9.8	14.5
Housatonic River.								
Gaylordsville, Conn.	50	15	9.4	8	4.9	19	6.2	4.5
Mohawk River.								
Utica, N. Y.[14]	98	.....	10.2	28	1.7	2, 19	5.7	8.5
Fort Hunter, N. Y.	42	.....	24.0	9	6.7	31	17.5	17.3
Schenectady, N. Y.	19	.....	14.0	27	2.0	1, 2	5.2	12.0
Hudson River.								
Glens Falls, N. Y.	197	.....	9.3	27, 28	5.4	3	7.3	3.9
Mechanicsville, N. Y.	166	.....	4.3	27	1.0	2	2.2	3.3
Troy, N. Y.	154	.....	17.3	27	5.9	3, 4	9.5	11.4
Albany, N. Y.	147	.....	13.8	27	4.1	1	6.9	9.7
Stuyvesant, N. Y.	128	.....	5.0	8, 29	1.0	14	3.2	4.0
Passaic River.								
Chatham, N. J.	69	.....	7.6	7	3.0	17, 18	4.2	4.6
Pompton River.								
Pompton Plains, N. J.[15]	6	.....	.....		.....		.....	.....
East Branch Susquehanna.								
Binghamton, N. Y.	306	16	17.8	27	3.1	2, 3	7.8	14.7
Towanda, Pa.	262	16	17.0	27	1.8	3	6.6	15.2
Wilkesbarre, Pa.	183	17	30.6	9	8.5	23	17.0	22.1
West Branch Susquehanna.								
Lockhaven, Pa.[16]	65	12	12.5	4	1.2	19, 20	3.5	11.3
Williamsport, Pa.	39	20	19.0	4	2.7	1	8.3	16.3
Susquehanna River.								
Selinsgrove, Pa.	116	17	12.0	27, 28	2.7	1	6.8	9.3
Harrisburg, Pa.	69	17	23.3	4	4.7	19, 20	10.5	18.6
Juniata River.								
Huntingdon, Pa.	90	24	11.0	3	4.1	17	5.4	6.9
Potomac River.								
Cumberland, Md.	290	8	5.7	23	3.0	1, 2	4.5	2.7
Harpers Ferry, W. Va.	172	18	8.0	9	1.8	21, 22	3.3	6.2
Shenandoah River.								
Riverton, Va.	58	22	.....		.....		.....	.....
James River.								
Lynchburg, Va.	260	18	6.6	8	1.7	1	2.5	4.9
Richmond, Va.	111	12	5.5	8	—0.8	4	0.8	6.3
Dan River.								
Danville, Va.	55	8	2.0	8	—0.1	5, 6, 21	0.3	2.1
Roanoke River.								
Clarksville, Va.	196	12	8.2	8	3.4	2, 3	4.6	4.8
Weldon, N. C.	129	30	25.3	9	10.1	20-22	12.7	15.2
Cape Fear River.								
Fayetteville, N. C.	112	38	25.0	9	6.0	22	11.3	19.0
Waccamaw River.								
Conway, S. C.	40	7	6.0	29-31	4.8	1-3	5.4	1.2
Pedee River.								
Cheraw, S. C.	149	27	15.2	9	2.8	22, 23	5.7	12.4
Smiths Mills, S. C.	51	16	14.2	2	7.4	26, 27	11.2	6.8
Lynch Creek.								
Effingham, S. C.	35	12	9.5	1	6.0	10, 11, 23	7.2	3.5
Black River.								
Kingstree, S. C.	52	12	9.9	1	7.0	21, 22, 26	8.4	2.9
Wateree River.								
Camden, S. C.	45	24	20.6	9	5.6	23	10.0	15.0
Congaree River.								
Columbia, S. C.	37	15	6.5	9	0.7	3	1.5	5.8
Santee River.								
St. Stephens, S. C.	50	12	8.9	3-5	5.9	26	7.8	3.0
Savannah River.								
Calhoun Falls, S. C.	347	15	4.7	7	2.6	6, 31	3.1	2.1
Augusta, Ga.	268	32	17.6	9	8.0	20	9.9	9.6
Broad River.								
Carlton, Ga.	30	11	5.7	8	2.5	20, 21	3.1	3.2
Oconee River.								
Dublin, Ga.	79	30	6.8	11	2.0	22, 23	3.8	4.8
Ocmulgee River.								
Macon, Ga.	203	18	7.3	8	3.0	31	4.3	4.3
Abbeville, Ga.	96	11	9.3	1	5.0	23	6.8	4.3
Flint River.								
Woodbury, Ga.	.....	.....	2.5	6	0.8	{21, 25, 28, 30, 31}	1.3	1.7
Albany, Ga.	80	20	8.2	1	4.1	26	6.1	4.1
Chattahoochee River.								
Oakdale, Ga.	305	18	8.2	8	1.8	21, 31	2.9	6.4
Westpoint, Ga.	239	20	6.0	8, 9	3.0	21, 22, 31	3.7	3.0
Eufaula, Ala.	90	40	12.0	9	4.0	24, 31	6.5	8.0
Coosa River.								
Rome, Ga.	271	30	8.8	24	2.3	1-4, 6	4.4	6.5
Gadsden, Ala.	144	22	9.6	16	2.4	2, 3	5.4	7.2
Lock No. 4, Ala.	116	17	8.0	16	2.3	3	4.7	5.7
Wetumpka, Ala.	6	45	12.8	17	6.3	24	9.1	6.5
Tallapoosa River.								
Milstead, Ala.	38	35	9.6	9	2.6	31	3.9	7.0
Alabama River.								
Montgomery, Ala.	265	35	9.4	18	4.0	6	6.4	5.4
Selma, Ala.	212	35	11.3	19	5.1	25	8.0	6.2
Tombigbee River.								
Columbus, Miss.	303	33	3.5	29-31	—1.3	1	0.8	4.8
Demopolis, Ala.[14]	155	35	19.7	31	2.4	5	10.0	17.3
Black Warrior River.								
Tuscaloosa, Ala.	90	43	22.2	16	6.0	6	12.7	16.2
Sabine River.								
Logansport, La.	180	25	10.5	31	3.0	13-18	5.5	7.5
Orange, Tex.	10	7	— 0.6	30, 31	—1.8	1-6	—1.3	1.2
Neches River.								
Rockland, Tex.	110	20	6.0	25	1.5	22	3.5	4.5

TABLE VII.—*Heights of rivers referred to zeros of gages.*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Neches River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet*	*Feet.*
Beaumont, Tex	40	10	2.4	30	—0.1	14	1.1	2.5
Trinity River.								
Dallas, Tex	330	25	27.2	27	1.8	10–12	7.7	25.4
Riverside, Tex	100	40	9.9	31	0.9	17, 19	2.7	9.0
Liberty, Tex	42	25	10.8	1	4.5	14, 15	6.0	6.3
Brazos River.								
Kopperl, Tex	369	21	2.6	27–29	—1.5	25	—0.2	4.1
Waco, Tex	301	24	5.1	29	2.0	14	2.5	3.1
Hempstead, Tex	215	40	1.7	31	—1.7	19–28	—1.1	3.4
Booth, Tex	76	39	3.5	1–3	1.6	28–31	2.5	1.9
Colorado River.								
Ballinger, Tex	400	21	1.2	1, 2, 17	1.0	3–16, 18–31	1.0	0.2
Austin, Tex	214	18	2.0	23	1.0	15, 16	1.3	1.0
Colorado River—Cont'd.								
Columbus, Tex	100	24	6.9	28	5.4	{9, 15, 16, 20–25}	5.6	1.5
Red River of the North.								
Moorhead, Minn.[8]	418	26	10.9	31	8.7	22, 23	.....	2.2
Columbia River								
Umatilla, Oreg.	270	25	9.7	11	3.5	5	6.1	6.2
The Dalles, Oreg.	166	40	15.7	11	6.0	5	9.9	9.7
Willamette River.								
Albany, Oreg.	118	20	21.0	10	9.5	27, 28	13.4	11.5
Portland, Oreg.	12	15	15.5	11	7.7	28	11.6	7.8
Sacramento River.								
Red Bluff, Cal.	265	23	26.3	10	10.4	27	17.8	15.9
Sacramento, Cal.	64	25	26.3	22	21.8	10	24.2	4.5

[1] Frozen for 28 days. [2] Frozen entire month. [3] Frozen for 24 days. [4] Frozen for 22 days. [5] Frozen for 8 days. [6] 16 days only. [7] 17 days only. [8] Frozen for 21 days. [9] 14 days only. [10] Frozen for 18 days. [11] Frozen for 4 days. [12] Frozen for 26 days. [13] Frozen for 23 days. [14] 29 days only. [15] Gage broken. [16] Frozen for 3 days.

HAWAIIAN CLIMATOLOGICAL DATA.

By R. C. LYDECKER, Territorial Meteorologist.

Rainfall data for March, 1904.

Stations.	Elevation.	Amount.
HAWAII.		
HILO, e. and ne.	*Feet.*	*Inches.*
Waiakea	50	0.90
Hilo (town)	.....	.....
Puueo	85	2.27
Kaumana	1,250	0.72
Pepeekeo	100	1.38
Hakalau	200	3.22
Honohina	300	3.80
Puuohua	1,050	5.83
Laupahoehoe	500	10.85
Ookala	400	.....
HAMAKUA, ne.		
Kukaiau	250	2.97
Paauilo	300	2.07
Paauhau	300	.....
Honokaa (Mill)	425	4.47
Honokaa (Meinicke)	1,100	5.86
Kukuihaele	700	4.14
KOHALA, n.		
Awini Ranch	1,100	8.78
Halawa	450	.....
Niulii	200	3.16
Kohala (Mission)	521	4.14
Kohala (Sugar Co.)	270	2.96
Hawi Mill	700	4.47
Puakea Ranch	600	4.18
Puuhue Ranch	1,847	5.16
Waimea	2,720	3.60
KONA, w.		
Huehue	2,000	8.00
Holualoa	1,350	8.40
Kaukahoku Leheula	3,500	.....
Kainaliu	1,470	.....
Kealakekua	1,580	6.23
Napoopoo	25	4.63
Hoopuloa	1,650	6.11
Hoopuloa	2,300	5.92
Puuwaawaa Ranch	2,700	6.30
Huehue	.....	.....
KAU, se.		
Kahuku Ranch	1,680	.....
Honuapo	15	4.44
Naalehu	650	5.61
Hilea	310	4.40
Pahala	850	4.69
Moaula	.....	.....
Volcano House	4,000	4.47
PUNA, e.		
Olaa, Mountain View (Russel)	1,530	.....
Olaa Plantation (Mill)	210	.....
Kapoho	110	2.43
Pahoa	600	3.13
MAUI.		
Lahaina	.....	.....
Waiopae Ranch	700	9.80
Kaupo (Mokulau), s.	285	9.48
Kipahulu, s	308	9.19
Hana	.....	.....
Nahiku, ne	900	9.88
Nahiku	1,600	13.00
Haiku, n	700	8.90
Kula (Erehwon), n	4,500	9.68
Kula (Waiakoa), n	2,700	10.65
Puuomalei, n	1,400	9.92
MAUI—Continued.		
Paia	180	8.91
Haleakala Ranch	2,000	9.20
Wailuku, ne	250	11.31
LANAI.		
Keomuku	10	6.78
OAHU.		
Punahou (W. B.), sw.	47	7.30
Kulaokahua (Castle), sw.	50	6.28
Makiki Reservoir	120	4.36
U. S. Naval Station, sw.	6	6.57
Kapiolani Park, sw.	10	5.46
College Hills	175	6.61
Manoa (Woodlawn Dairy), c.	285	6.90
Manoa (Rhodes Gardens)	360	8.04
Insane Asylum	30	6.91
School street (Bishop), sw.	.....	.....
Kamehameha School	.....	.....
Kalihi-Uka, sw	485	.....
Nuuanu (W. W. Hall), sw.	50	6.68
Nuuanu (Wyllie street)	250	6.86
Nuuanu (Elec. Station), sw.	405	6.65
Nuuanu (Luakaha), c.	850	11.03
U. S. Experiment Station	350	7.25
Kaliula	1,150	.....
Laniakea (Nahuina)	.....	.....
Tantalus Heights (Frear)	1,360	5.93
Waimanalo, ne.	25	16.35
Maunawili, ne.	300	19.97
Kaneohe	100	14.52
Ahuimanu, ne.	350	19.37
Kahuku, n	25	9.25
Waialua	.....	.....
Wahiawa	900	15.61
Ewa Plantation, s.	60	6.97
U. S. Magnetic Station	.....	.....
Waipahu	200	7.17
Moanalua	15	7.18
Pacific Heights	.....	.....
KAUAI.		
Lihue (Grove Farm), e.	200	10.43
Lihue (Molokoa), e.	300	10.21
Lihue (Kukaua), e.	1,000	11.09
Lihue (Kilohana)	400	.....
Kealia, e.	15	.....
Kilauea (Plantation), ne.	325	17.03
Hanalei, n.	10	.....
Waioli	.....	.....
Haena	.....	.....
Waiawa	32	6.33
Eleele	150	4.74
Wahiawa (Mountain)	3,000	.....
McBryde (Residence)	850	5.50
Lawai (Gov. Road)	450	7.14
Lawai, w	225	4.78
Lawai, e	800	5.57
Koloa	100	6.24
Lawai Beach	.....	.....
Delayed February reports.		
Pahala	.....	15.10
Hawi Mill	.....	13.43
Ookala	.....	10.30
U. S. Magnetic Station	.....	25.29
Honokaa	.....	16.71
Kilauea	.....	15.35

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.

GENERAL SUMMARY FOR MARCH, 1904.

The record for the month, as a whole, was unique in the annals of the Weather Bureau. Light southerly winds and calms predominated, while the trades were conspicuous by their absence, and though there were light airs from that quarter during a portion of six days, they could by no means be designated as trade winds. The consecutive number of days of southerly winds was the greatest on record, while the wind force was the lightest, probably the lightest known here, the

Meteorological Observations at Honolulu, March, 1904.

The station is at 21° 18′ north, 157° 50′ west. It is the Hawaiian Weather Bureau station Punahou. (See fig. 2, No. 1, in the MONTHLY WEATHER REVIEW for July, 1902, page 365.)

Hawaiian standard time is 10h 30m slow of Greenwich time. Honolulu local mean time is 10h 31m slow of Greenwich.

The pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

Rainfall for twenty-four hours is measured at 9 a. m. local, or 7:31 p. m., Greenwich time.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature. Dry bulb.	Temperature. Wet bulb.	During twenty-four hours preceding 1 p. m. Greenwich time, or 2:30 a. m. Honolulu time. Temperature. Maximum.	Temperature. Minimum.	Means. Dew-point.	Means. Relative humidity.	Wind. Prevailing direction.	Wind. Force.	Average cloudiness.	Sea-level pressures. Maximum.	Sea-level pressures. Minimum.	Total rainfall at 9 a. m., local time.
	*	†	†			‡	‡		⁂				
1	29.92	66	65.5	79	70	66.5	85	sw.	0	10	29.95	29.86	0.01
2	29.90	68	65	77	65	63.5	78	w-sw.	0	4–10	29.95	29.79	0.42
3	29.85	73	69.5	75	67	65.5	89	nne.	0	6–10	29.96	29.80	T.
4	29.90	73	70	78	66	68.5	82	s.	0–1	8–5	29.90	29.84	0.55
5	29.92	73	70	79	66	70.0	83	sw.	1–0	10–5	29.95	29.81	0.18
6	29.96	71	70	75	70	69.3	89	s.	0	10–8	29.99	29.83	0.28
7	30.01	70	67	78	70	71.5	83	sw-s.	0	8	30.04	29.95	0.40
8	29.96	71	69	79	67	66.5	79	w-ne-s.	0–1	5–7	30.03	29.95	T.
9	29.92	68	67	78	68	68.7	86	s.	1–0	5–10	29.98	29.90	T.
10	29.97	66	65	80	68	67.0	85	s.	0	5	30.00	29.91	.01
11	29.90	70	68.5	80	66	64.3	77	s.	0	5	30.00	29.91	T.
12	29.86	68	67.5	74	66	67.7	91	se.	0	8	29.99	29.90	0.03
13	29.81	68	67.5	76	66	67.3	89	se.-s.	1–0	10–6	29.93	29.85	1.25
14	29.85	65	64	76	66	64.7	82	s.	0	10	29.91	29.83	0.20
15	29.84	67	66	72	65	64.0	92	s.	0	10–7	29.86	29.81	1.41
16	29.84	69	68	78	65	67.0	88	s.-sw.	0	10–5	29.87	29.78	0.22
17	29.84	70	67.5	77	66	68.5	87	s.-sw.	1–0	10–3	29.86	29.78	0.24
18	29.89	73	71	78	69	67.0	83	sw.	1–0	6	29.90	29.83	0.14
19	29.95	73	71.5	79	70	70.3	86	s.-sse.	0	10–4	29.94	29.85	0.03
20	30.03	70	67	79	72	70.7	88	s.	0	10–4	30.03	29.94	0.01
21	30.00	69	67	79	67	67.5	83	ne.-s.	0	5–10	30.05	29.96	0.01
22	29.92	68	67	78	68	65.5	78	ne.	0	10–7	30.01	29.91	0.01
23	29.90	66	62.5	79	68	66.0	82	ne.-sw.	1–0	4–10	29.95	29.85	0.00
24	29.89	65	64.5	69	63	61.7	93	ne.-nw.	3–0	10	30.00	29.89	0.65
25	29.88	59	56	76	63	61.3	83	sw.-w.	1–0	5–0	29.93	29.85	0.80
26	29.89	62	60	75	57	54.7	69	w.-nw.	1–0	5–0	29.94	29.85	0.00
27	29.88	61	59	74	58	57.7	74	ne.	1–0	4	29.93	29.85	0.00
28	29.91	62	60	77	60	58.7	75	sw.	1–0	0–7	29.96	29.86	0.00
29	29.92	68	65	79	62	61.5	75	sw.	0	0–8	30.00	29.93	0.00
30	29.95	71	69	74	68	68.3	91	ne.	0	3–10	30.06	29.96	0.02
31	29.94	68	67	80	69	66.5	83	sw.	0	7–10	30.00	29.92	0.43
Sums	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7.30
Means	29.910	68.1	66.2	77.0	66.2	65.7	83.5	.....	0.24	6.7	29.964	29.869	.....
Departure.	—.089	.....	.....	.....	.....	+4.2	‖	.....	.....	+2.1	.....	.....	+3.54

Mean temperature for the month of March, 1904, (6 + 2 + 9) + 3 = 71.2°; normal is 70.7°.
Mean pressure for the month of March, 1904, (9 + 3) + 2 = 29.921; normal is 30.010.

* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:31 p. m., Greenwich time. ‡ These values are the means of (6 + 9 + 2 + 9) + 4. ⁂ Beaufort scale. ‖ +11.8.

Maximum thermometer set at 9 p. m. and minimum at 2 p. m., local time.

average for the month being but 0.26, Beaufort scale. As shown by the records of this office the average force of the March winds is 3.2.

The mean pressure for the month, 29.921, was .089 below the normal, a departure only exceeded once before (February, 1902, —.121) in the history of the Weather Bureau.

The rainfall was considerably in excess of the normal on all the islands with the exception of Hawaii, where, with the exception of the Kona district, the precipitation was much less than normal. This was also the case at the stations in the Honolulu and Nuuanu districts on Oahu above the 100-foot elevation. In these districts the heavy rains fell at the stations below this altitude, while at the stations above the downfall was less than normal.

As a result of the conditions above mentioned the relative humidity, dew-point, and cloudiness were all greatly in excess of their respective normals.

The artesian well water showed the effects of the heavy rains of February, and rose to 35.85 feet above mean sea level. These are the highest figures reached since this series of observations was taken up in March, 1899, and the end of April will doubtless show a much higher level. When the level of this water was first ascertained in 1882, it stood at 42 feet above mean sea level.

Honolulu.—Temperature mean for the month, 71.2°; normal, 70.7°; average daily maximum, 77.0°; average daily minimum, 66.2°; mean daily range, 10.8°; greatest daily range, 18° (25th); least daily range, 5° (5th); highest temperature, 80° (9th, 10th, and 30th); lowest temperature, 57° (25th).

Barometer average, 29.921; normal, 30.010; highest, 30.06 (29th); lowest, 29.78 (15th and 16th); greatest 24-hour change, that is from any given hour of one day to the same hour on the next, .10 (3 p. m. 18th to 3 p. m. 19th); lows passed this point 1st to 4th, 12th to 18th, and 24th to 27th, inclusive; highs, 19th, 20th, and 29th.

Relative humidity average, 83.5 per cent; normal, 71.7 per cent; mean dew-point, 65.7°; normal, 61.5°; mean absolute moisture, 6.96 grains per cubic foot; normal, 6.05 grains.

Rainfall, 7.30 inches; normal, 3.76 inches; greatest rainfall in twenty-four hours 1.41 inches (14th); rain record days, 22; normal, 18.

The artesian well water level rose from 34.80 to 35.85 feet above mean sea level. March 31, 1903, it stood at 34.85. The average daily mean sea level for the month was 9.77, the assumed annual mean being 10 feet above datum. For March 1903, it was 9.59.

Trade wind days, none; normal, 18; average force of wind, Beaufort scale and during daylight only, 0.26; average cloudiness, tenths of sky, 6.7; normal, 4.6.

Approximate percentages of district rainfall as compared with normal: Hawaii, Hilo district, 12 per cent; Hamakua, 37; Kohala, 56; Waimea, 70; Kona, 162; Kau, 90; Puna, 27; island of Maui, 198; Oahu, Honolulu district, below 100 feet elevation, 189; above, 55; Nuuanu, below 100 feet elevation, 181; above, 82; Koolau, 254; Ewa, 356; Kauai, Lihue district, 228; Hanalei, 167; Waimea, 276.

The heaviest monthly rainfall was at Maunawili, Oahu, 19.97 inches. The heaviest 24-hour rainfalls were at Awini Ranch, Hawaii, 5.46 inches, 23d and Kipahulu, Maui, 4.43, same date.

Temperature table for March, 1904.

Stations.	Elevation.	Mean max.	Mean min.	Cor. av'ge.	Highest.	Lowest.
	Feet.	°	°	°	°	°
Hilo	40	84.2	64.9	73.9	89	62
Pepeekeo	100	78.8	67.7	72.6	83	66
Olaa Mill	210	.....	.....	.....	.....	.....
Kohala	521	80.0	67.1	72.9	86	63
Waimea	2,730	74.9	57.2	65.4	80	52
Volcano House	4,000	.....	.....	.....	.....	.....
Waiakoa	2,700	74.5	58.1	65.6	81	50
Keomuku	10	79.0	71.5	75.1	85	66
Kinau	50	76.7	66.0	70.6	80	56
Ewa Plantation	60	76.3	63.7	69.3	80	54
United States Experiment Station	350	78.1	66.5	71.7	82	59

Kohala, dew-point, 65.0°; relative humidity, 77.9 per cent.

Ewa Mill, dew-point, 63.0°; relative humidity, 79.0 per cent; barometer average, 29.88.

Honolulu—Dew ten mornings; lightning to southward on the evenings of the 12th and 15th; electric storms, 17th and 19th; thunder, 29th at 8:45 a. m.

Reported from other stations: Hawaii, Kapoho, southerly winds all the month. Pepeekeo, large meteor March 8, at 11:45 p. m., moving from west to east; more or less snow on mountains all the month; very dry and streams running low; thunder 14th and lightning 15th; 18th, distant lightning all night; thunder 28th; large halo round the sun 21st at 12m., and 29th at 11 a. m.; dew nine mornings; heavy surf 23d and 26th; wind force, 2.4; cloudiness, 5.7. Kohala, earthquake 29th at 11:45 a. m., and 30th at 12:15 p. m. Waimea, earthquake 29th; calms and light westerly winds predominated. Hilo, clear weather throughout the month excepting the 24th and 25th.

COSTA RICAN CLIMATOLOGICAL DATA.

Communicated by Mr. H. PITTIER, Director, Physico-Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San José de Costa Rica, during March, 1904.*

Hours.	Pressure.		Temperature.		Relative humidity.		Rainfall.		
	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Duration, 1904.
	Inches.	*Inches.*	° *F.*	° *F.*	%	%	*Ins.*	*Ins.*	*Hrs.*
1 a. m	26.16	26.15	60.9	61.5	85	83	T.	T.	0.67
2 a. m	26.14	26.14	60.3	61.8	86	83	T.	T.	0.33
3 a. m	26.12	26.12	59.7	61.3	86	84	.....	.....	.....
4 a. m	26.11	26.11	59.4	61.0	86	84	.....	.....	.....
5 a. m	26.12	26.12	58.9	60.8	85	83	.....	.....	.....
6 a. m	26.12	26.13	58.8	60.5	84	83	.....	.....	.....
7 a. m	26.14	26.14	58.6	60.9	84	82	.....	.....	.....
8 a. m	26.15	26.16	62.8	64.0	70	76	.....	.....	.....
9 a. m	26.16	26.17	67.6	68.0	61	67	.....	.....	.....
10 a. m	26.17	26.17	72.6	74.0	56	61	.....	T.	.....
11 a. m	26.16	26.17	75.7	75.9	49	54	.....	0.01	.....
Noon	26.15	26.15	78.5	77.8	47	52	.....	0.02	.....
1 p. m	26.13	26.13	80.2	79.4	49	51	.....	T.	.....
2 p. m	26.13	26.11	78.7	79.3	49	51	0.10	0.05	0.66
3 p. m	26.09	26.10	77.3	77.6	52	53	0.09	0.04	2.00
4 p. m	26.08	26.08	74.1	75.4	61	59	0.02	0.07	1.34
5 p. m	26.08	26.09	70.7	69.4	63	64	0.55	0.07	2.16
6 p. m	26.09	26.10	68.1	68.4	74	71	0.04	0.05	1.00
7 p. m	26.13	26.11	66.1	66.7	80	77	0.18	0.11	2.16
8 p. m	26.13	26.13	64.6	65.3	82	79	0.27	0.04	2.83
9 p. m	26.15	26.15	63.7	64.7	82	80	0.15	0.04	2.50
10 p. m	26.16	26.16	63.3	63.6	82	82	0.41	0.06	3.50
11 p. m	26.17	26.17	62.5	63.2	83	82	0.29	0.01	3.50
Midnight	26.17	26.16	61.5	62.8	85	82	0.06	0.02	1.50
Mean	26.13	26.13	66.8	67.6	72	72	.....	.....	.....
Minimum	26.04	25.98	53.2	49.8	26	.....	.....	.....	.....
Maximum	26.22	26.25	84.4	90.7	100	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	2.16	0.59	24.15

REMARKS.—At San José the barometer is 3,835 feet above sea level. Readings are corrected for gravity, temperature, and instrumental error. The hourly readings for pressure, and wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The thermometers are 5 feet above ground and are corrected for instrumental errors. The total hourly rainfall is as given by Hottinger's self-register, checked once a day. Under maximum, the greatest hourly rainfall for the month is given. The standard rain gage is 5 feet above ground. Since January 1, 1902, observations at San José have been made on seventy-fifth meridian time, which is 0 hours, 36 minutes, 13.3 seconds *in advance* of San José local time. The normals for pressure, temperature, and relative humidity have been adjusted to this time; the normal for rainfall in Table 1 and the sunshine observations and normal in Table 2 refer to local time. At Port Limon the hours of direct observation are 8 a. m., 2 and 8 p. m., San José local time; the barometer is 14 feet above sea level. The means for temperature and relative humidity in Table 4 are obtained from two-hourly readings given by a Richard self-registering thermometer.

TABLE 2.—*San José, March, 1904.*

Time.	Sunshine.		Cloudiness.		Temperature of the soil at depth of—				
	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	6 inches.	12 inches.	24 inches.	48 inches.	120 inches.
	Hours.	*Hours.*	%	%	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*
7 a. m	15.64	13.32	29	35	73.0	73.3	73.2	70.8	69.9
8 a. m	27.75	24.63	.....	.....	.....	.....	.....	.....	.....
9 a. m	28.42	24.15	.....	.....	.....	.....	.....	.....	.....
10 a. m	28.29	23.34	39	42	73.0	73.1	73.2	71.0	.....
11 a. m	27.79	22.65	.....	.....	.....	.....	.....	.....	.....
Noon	27.85	22.11	.....	.....	.....	.....	.....	.....	.....
1 p. m	25.96	22.09	58	49	74.3	73.6	73.1	71.0	.....
2 p. m	23.70	22.88	.....	.....	.....	.....	.....	.....	.....
3 p. m	19.88	21.47	.....	.....	.....	.....	.....	.....	.....
4 p. m	16.05	18.47	62	60	75.3	74.1	73.3	70.7	.....
5 p. m	9.90	13.73	.....	.....	.....	.....	.....	.....	.....
6 p. m	4.03	5.40	.....	.....	.....	.....	.....	.....	.....
7 p. m	.....	.....	73	58	75.2	74.3	73.3	70.9	.....
8 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
9 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
10 p. m	.....	.....	56	44	74.7	74.2	73.3	70.9	.....
11 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
Midnight	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean	.....	.....	55	48	74.2	73.8	73.2	70.9	69.9
Total	255.26	234.22	.....	.....	.....	.....	.....	.....	.....

TABLE 3.—*Rainfall at stations in Costa Rica, March, 1904.*

Stations.	Height above sea level.	Observed, 1904.		Averages.		
		Amount.	Number of days.	Number of years.	Amount.	Number of days.
	Feet.	*Inches.*			*Inches.*	
Sipurio (Talamanca)	197	6.18	12	4	5.12	11
Boca Banano	10	8.90	16	8	7.64	17
Port Limon	10	.....	.....	10	5.59	16
Swamp Mouth	10	4.53	13	6	8.66	12
Zent	66	2.28	10	3	13.39	14
Siquirres	197	0.08	3	6	9.76	9
Dos Novillos	400	.....	.....	.....	.....	.....
Guapiles	984	6.42	13	4	5.35	13
Cariblanco (Sarapiqui)	2,740	.....	.....	6	6.46	14
San Carlos	528	2.17	9	6	4.88	10
Las Lomas	873	1.26	9	4	5.87	11
Peralta	1,089	3.19	15	6	7.13	12
Turrialba	2,034	.....	.....	9	3.50	11
Juan Viñas	3,412	0.71	9	8	5.12	4
Santiago	3,609	1.61	14	3	3.46	6
Paraiso	4,383	0.08	2	3	0.94	5
Cachi	3,346	.....	.....	3	11.30	8
Las Concavas	4,386	1.18	10	3	8.15	11
Cartago	4,761	.....	.....	3	0.91	4
Tres Rios	4,265	2.48	7	15	0.59	3
San Francisco Guadalupe	3,894	2.05	9	8	0.67	2
San José	3,806	2.16	10	15	0.59	2
La Verbena	3,740	2.48	11	8	0.75	3
Nuestro Amo	2,595	17.40	11	8	2.01	3
Alajuela	3,117	.....	.....	4	1.38	4
San Isidro Alajuela	4,416	5.94	11	3	4.88	9
Las Cañas	2,559	.....	.....	.....	.....	.....

CLIMATOLOGICAL DATA FOR JAMAICA.

Through the kindness of Mr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following table in advance of the regular monthly weather report for Jamaica:

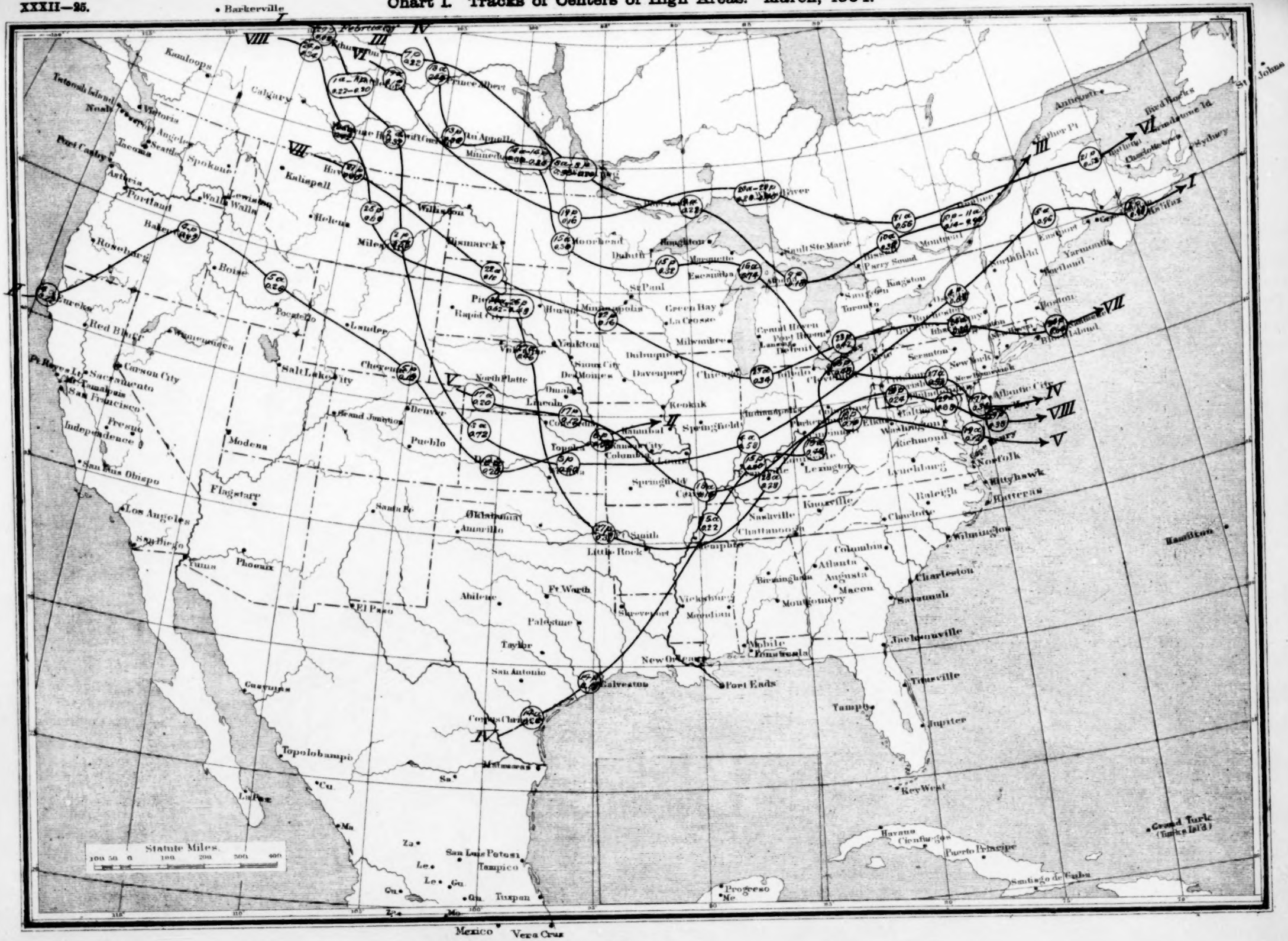
Comparative table of rainfall for March, 1904.

[Based upon the average stations only.]

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1904.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	21	6.07	3.74
Northern division	22	49	3.18	2.24
West-central division	26	22	11.37	4.21
Southern division	27	31	6.74	2.40
Means	100	123	6.68	3.14

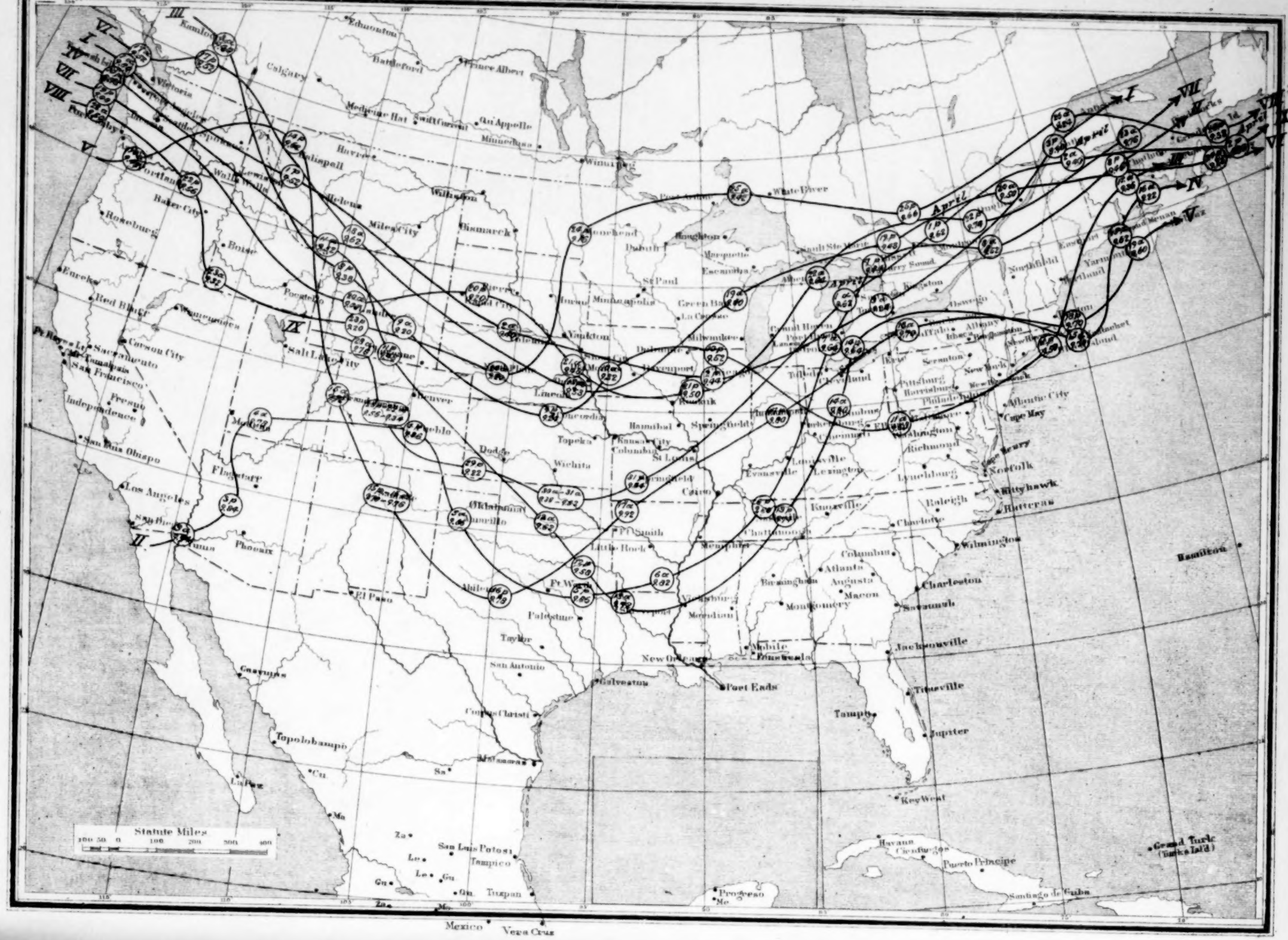
The rainfall for March was, therefore, twice as much as the average for the whole island; the greatest fall, 23.80 inches, occurred at Pepper, and the least, 0.22 inch, at Port Royal, N. Hospital, both in the southern division.

Chart I. Tracks of Centers of High Areas. March, 1904.



• Barkerville

Chart II. Tracks of Centers of Low Areas. March, 1904.



• Barkerville

Chart III. Total Precipitation. March, 1904.

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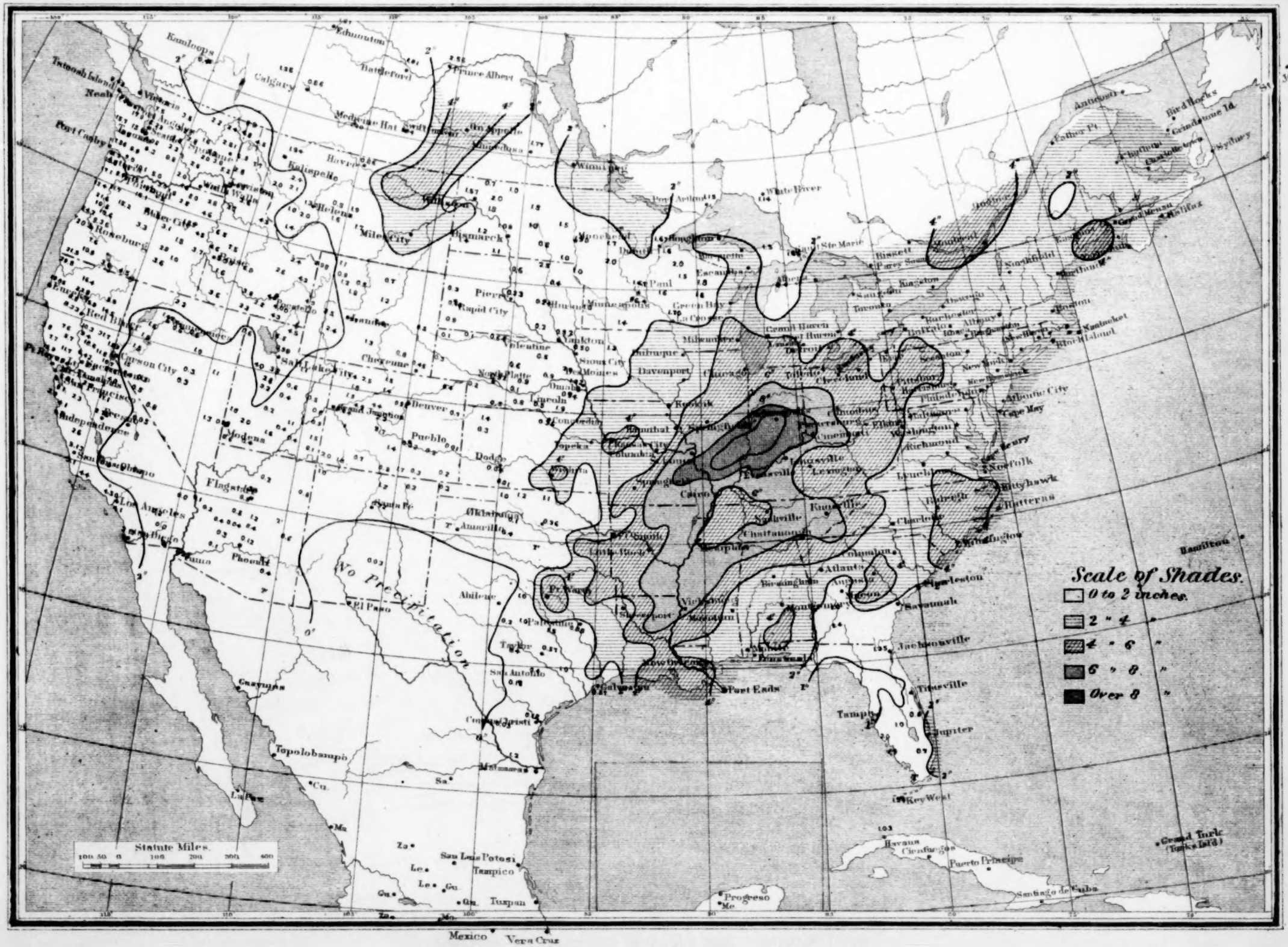

• Barkerville

Chart IV. Percentage of Clear Sky. March, 1904.

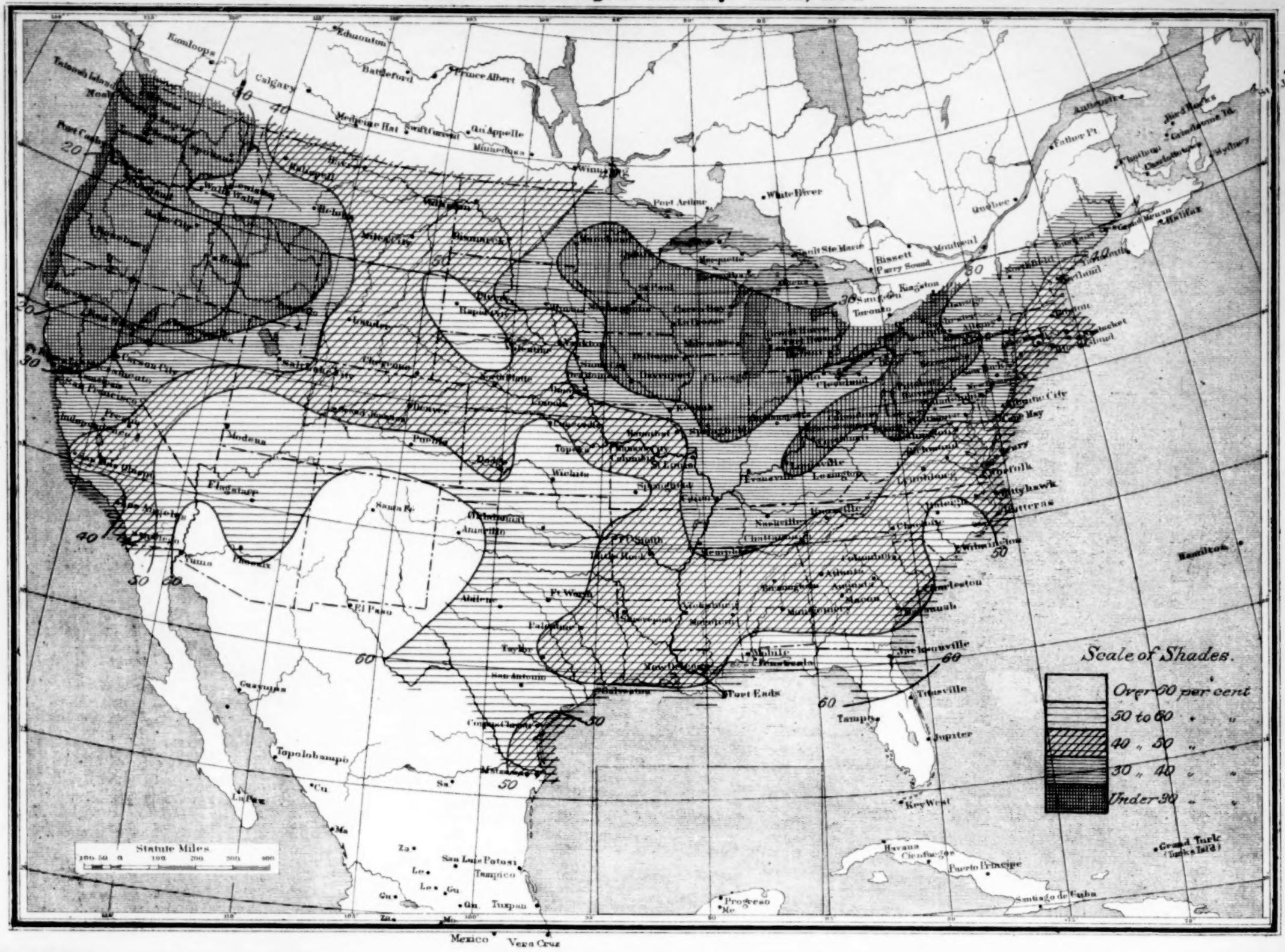

Chart V. Surface Temperatures: Maximum, Minimum, and Mean. March, 1904.

Chart V. Surface Temperatures; Maximum, Minimum, and Mean. March, 1904.

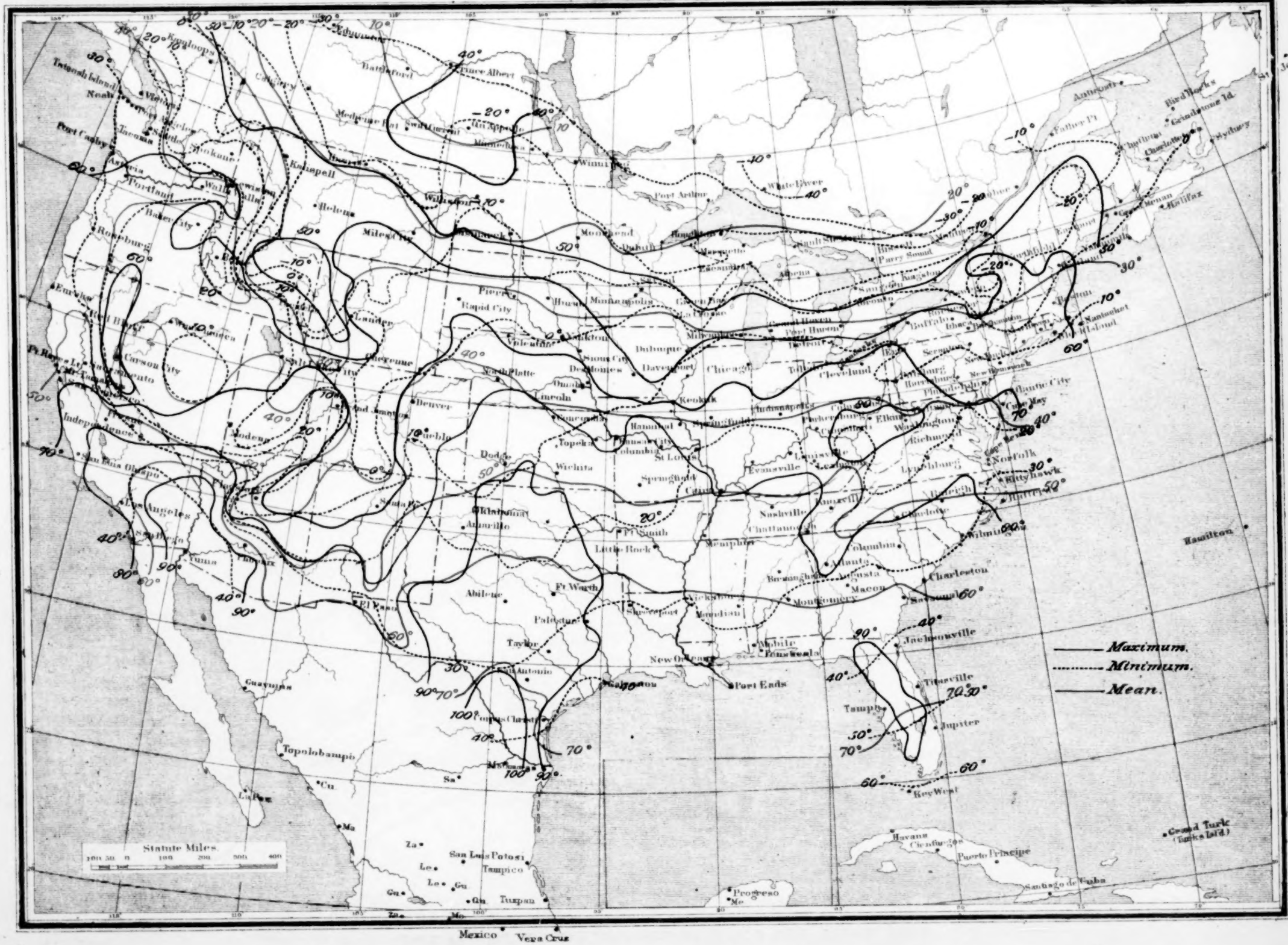

Chart VI. Isobars and Isotherms at 10,000 feet. March, 1904.

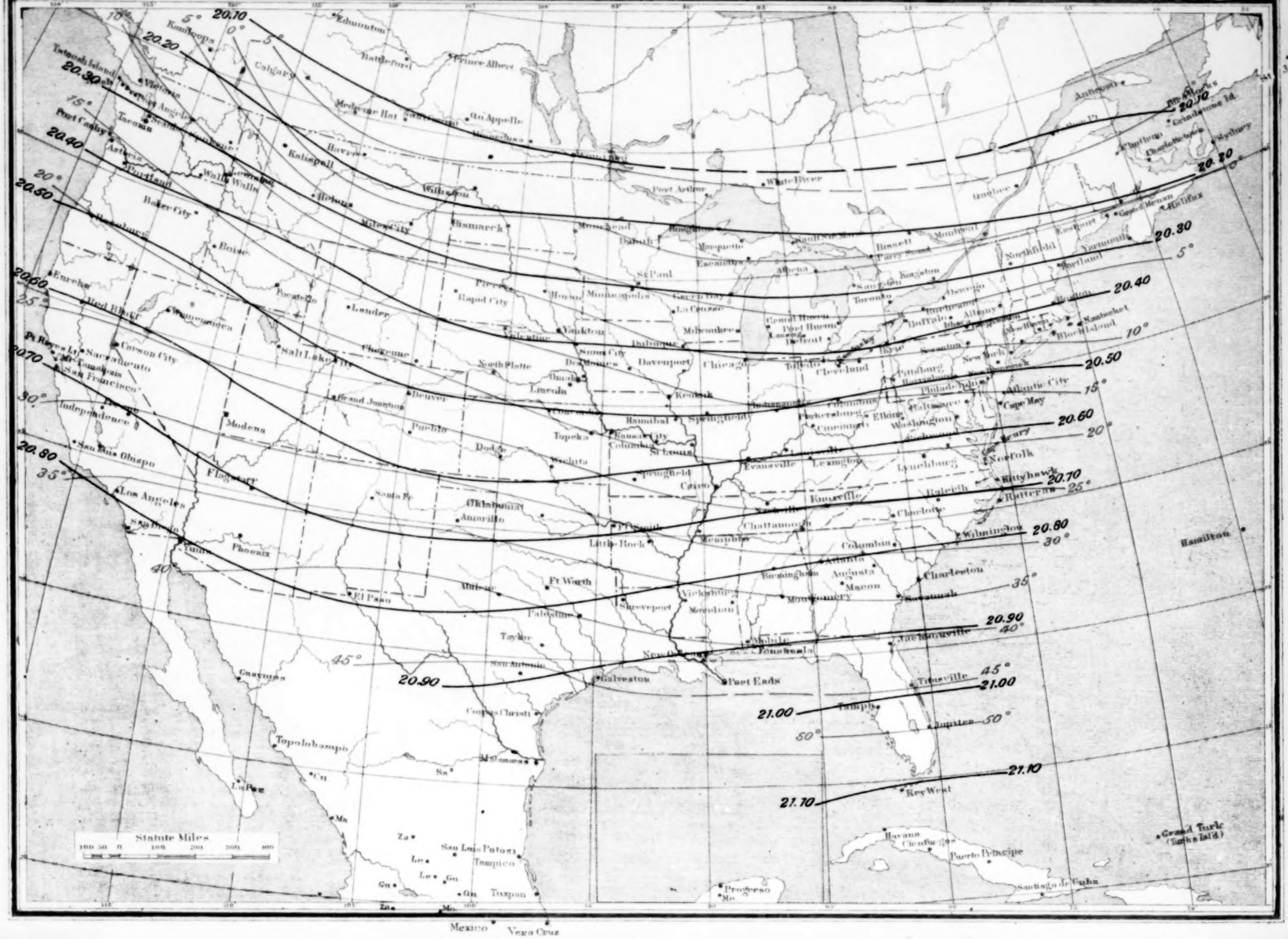

Chart VII. Isobars and Isotherms at 3500 feet. March, 1904.

• Barkerville

Chart VII. Isobars and Isotherms at 3500 feet. March, 1904.

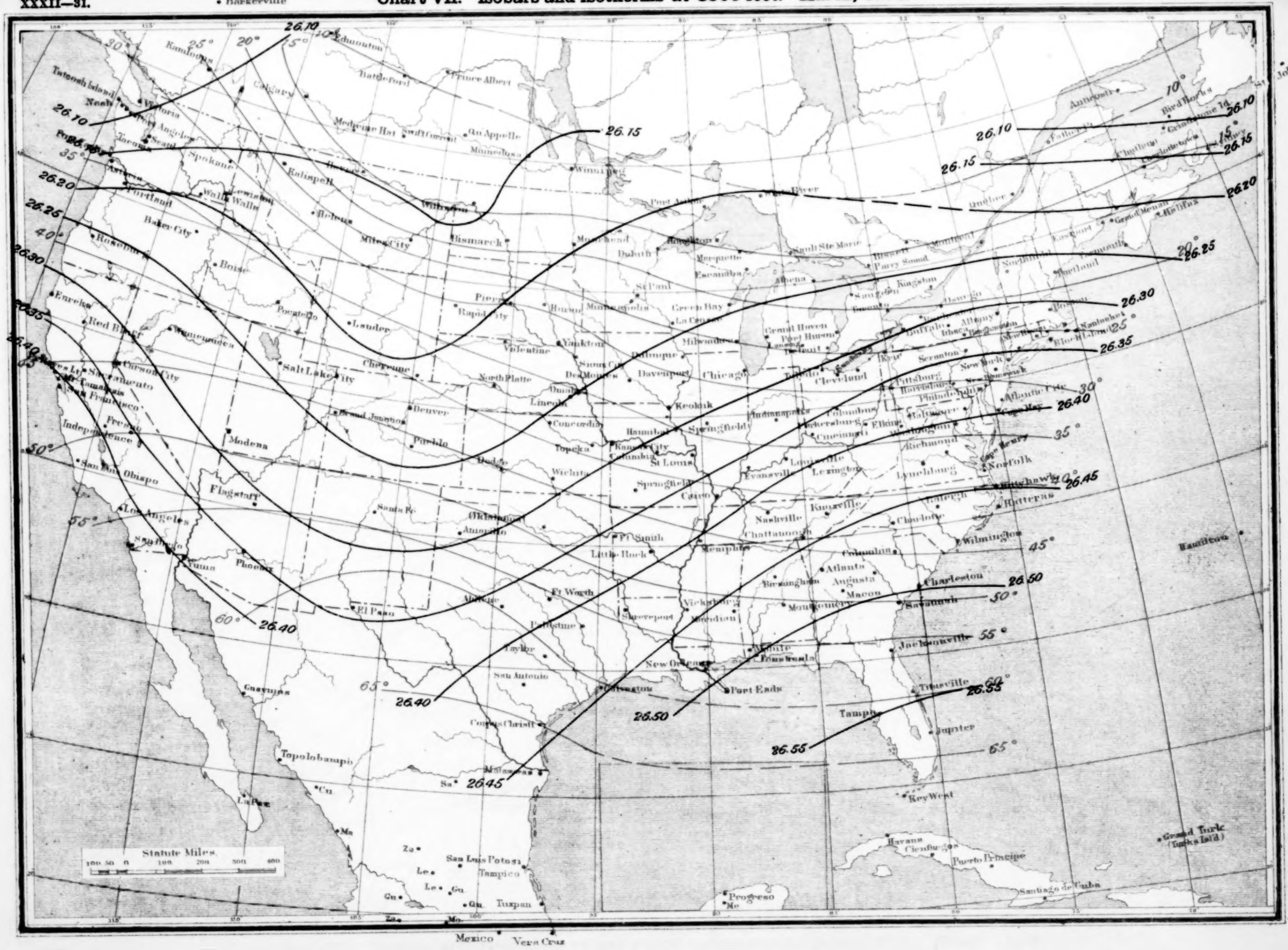

Chart VIII. Isobars and Isotherms at Sea Level; Resultant Surface Winds. March, 1904.

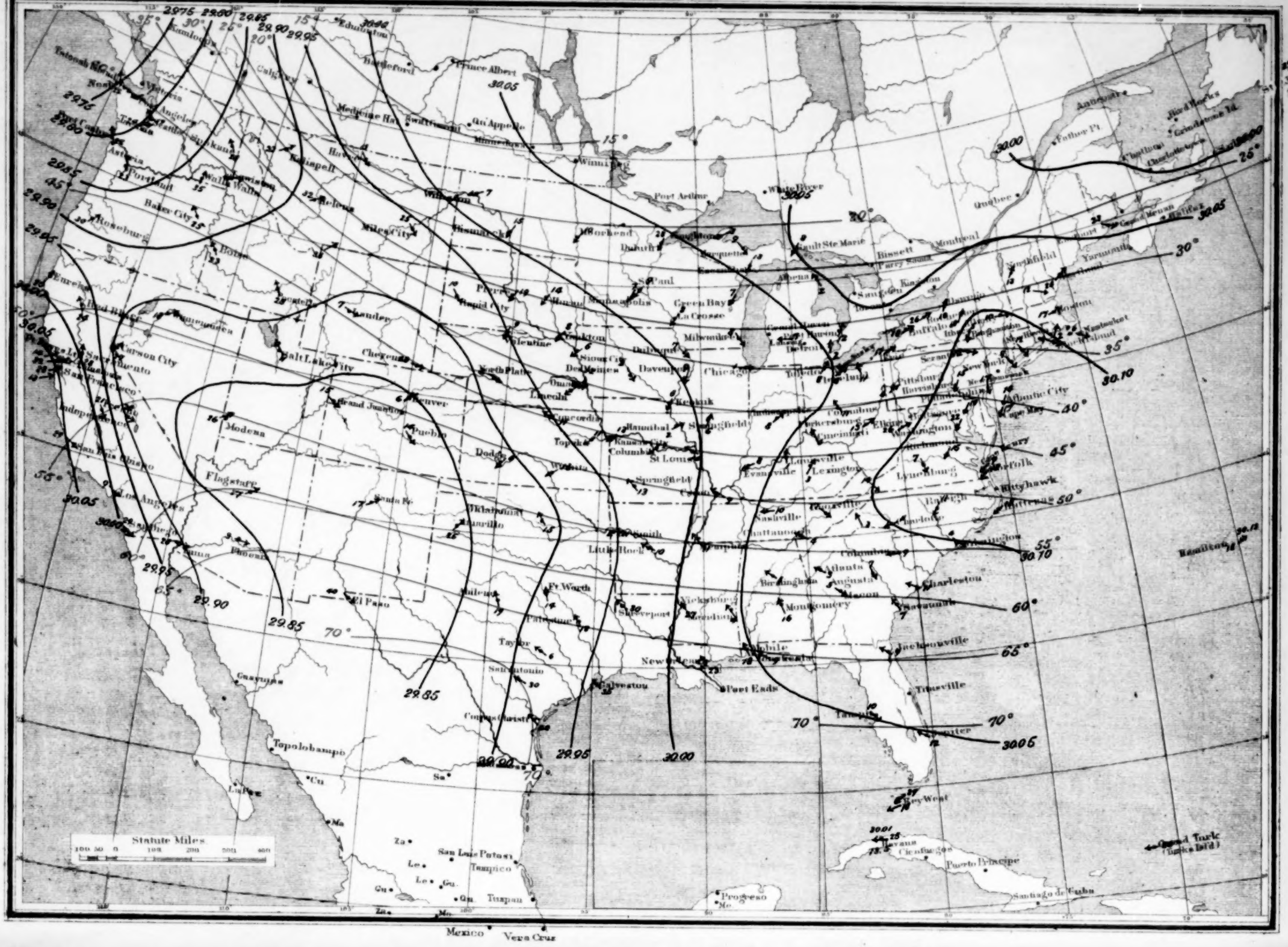

Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds. March, 1904.

Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds. March, 1904.

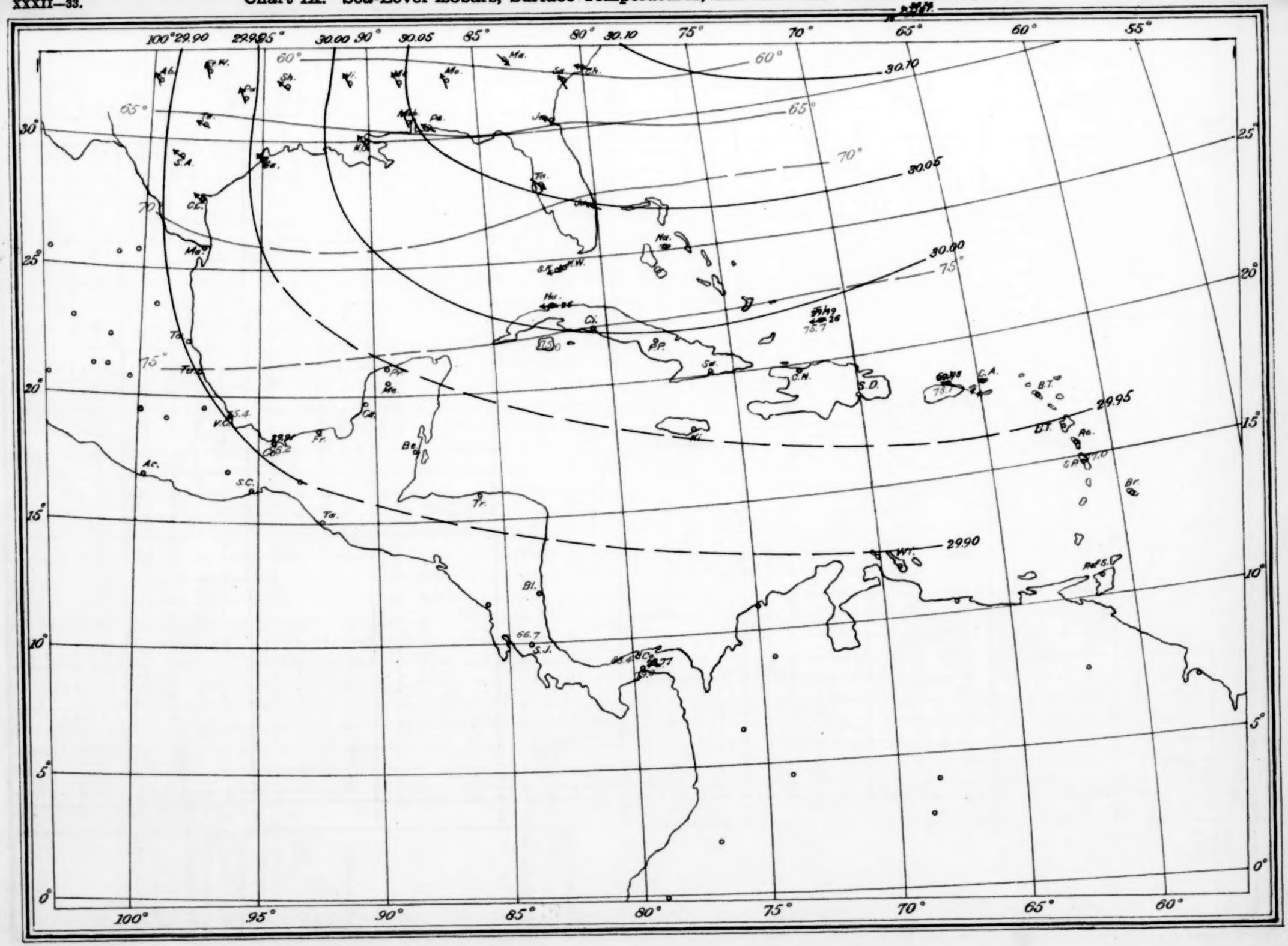
100° 29.90 29.95° 30.00 90° 30.05 85° 80° 30.10 75° 70° 65° 60° 55°
60°
65°
70°
75°
30.10
30.05
30.00
29.95
29.90
30°
25°
20°
15°
10°
5°
0°
100°
95°
90°
85°
80°
75°
70°
65°
60°
S.A.
Ac.
S.C.
Ta.
Tr.
Bl.
S.J.
Co.
Ma.
Ve.
Ha.
Ci.
P.P.
Sa.
C.N.
S.D.
C.A.
B.T.
Ro.
Br.
Wi.
Ar.S.
Gr.W.
Ch.
Ja.
Pa.
Ha.
K.W.
Nu.
Ti.
Ca.
Pe.
Ge.
Ki.
Be.
Fr.
Gu.
Ma.
Mo.
Sh.
Ab.
Cu.
Ne.
Wi.
Ma.
Ch.
Ja.
Ti.
Ha.
Nu.
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Chart X. Hydrographs for Seven Principal Rivers of the United States. March, 1904.

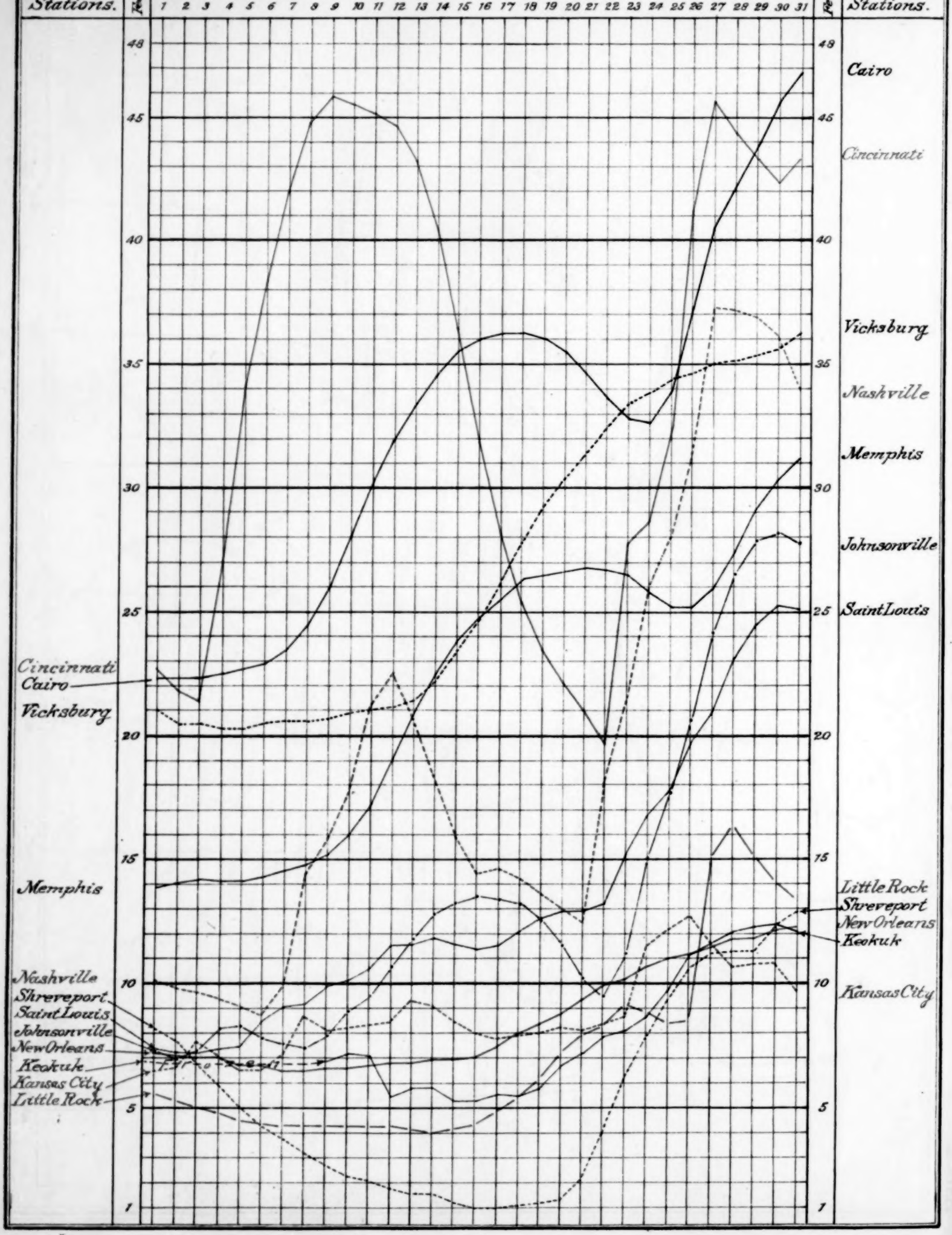
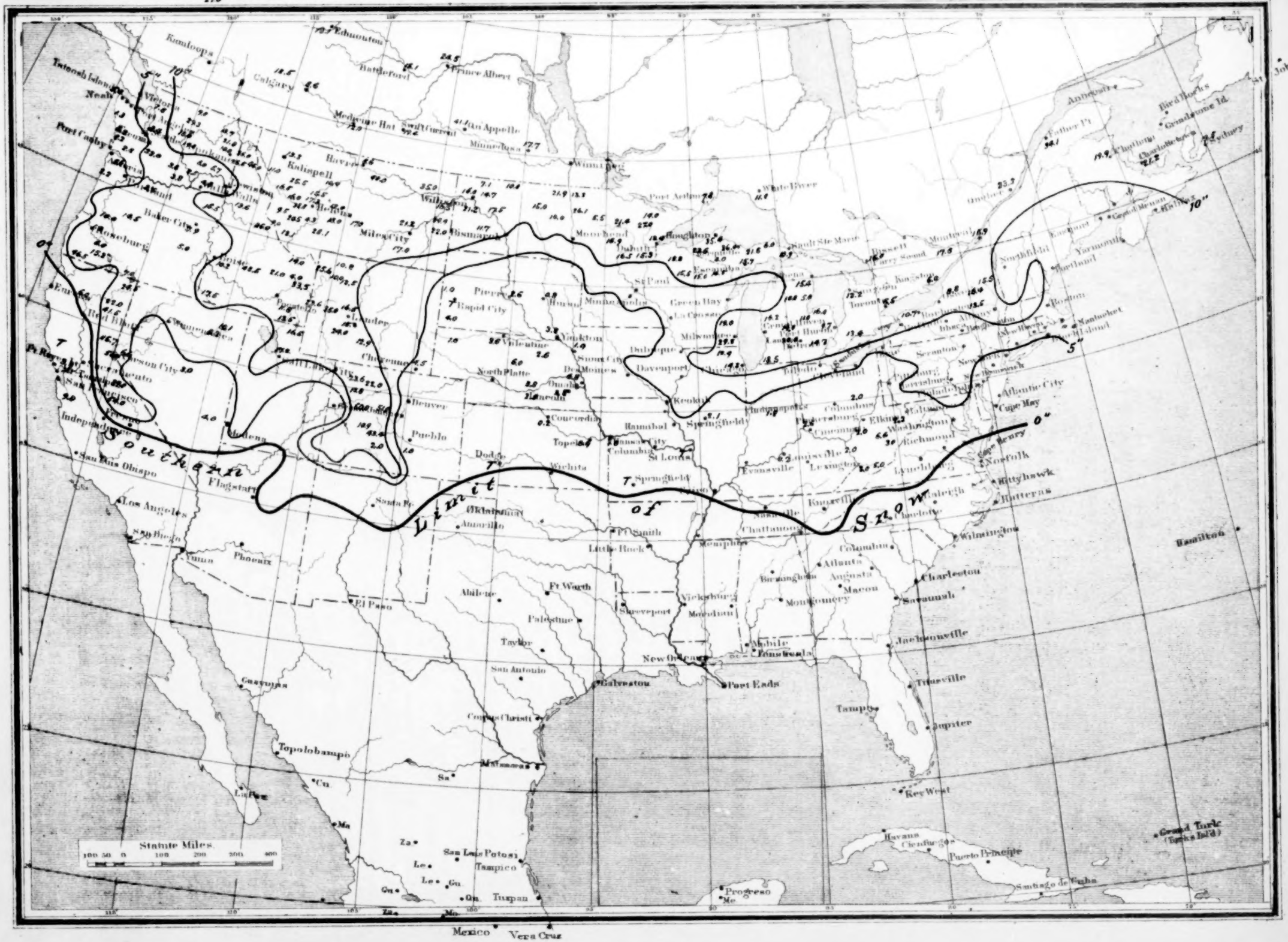
Chart XI. Total Snowfall. March, 1904.